Summary of Results for 30 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S9.006	S46	16.585	0.320	0.000	1.15		643.5	SURCHARGED
S9.007	S47	16.266	0.221	0.000	1.21		681.9	FLOOD RISK
S11.000	S48	16.311	-0.364	0.000	0.20		90.5	OK
S9.008	S49	16.224	0.209	0.000	1.35		731.9	FLOOD RISK
S9.009	S50	16.173	0.188	0.000	0.97		720.6	FLOOD RISK
S9.010	S51	16.037	0.202	0.000	0.98		756.4	FLOOD RISK
S9.011	S52	15.853	0.208	0.000	1.53		753.2	SURCHARGED
S9.012	S53	15.746	-0.354	0.000	0.75		753.3	OK
S12.000	S54	15.906	-0.044	0.000	0.88		611.0	OK
S12.001	S55	15.660	-0.440	0.000	0.60		609.4	OK
S13.000	S56	17.150	-0.310	0.000	0.21		57.2	OK
S13.001	S57	16.910	-0.320	0.000	0.18		56.9	OK
S13.002	S58	16.754	0.269	0.000	1.11		385.1	SURCHARGED
S13.003	S59	16.048	0.133	0.000	1.61		382.1	SURCHARGED
S13.004	S60	15.709	-0.591	0.000	0.35		381.8	OK
S14.000	S61	15.927	0.032	0.000	1.65		224.6	SURCHARGED
S14.001	S62	15.831	-0.499	0.000	0.50		643.9	OK
S1.011	S63	14.923	0.623	0.000	0.05		53.0	SURCHARGED
S15.000	S64	14.712	0.738	0.000	1.40		332.9	SURCHARGED
S16.000	S65	14.071	-0.060	0.000	0.67		73.6	OK
S15.001	S66	13.836	0.311	0.000	1.59		396.0	SURCHARGED
S1.012	S67	13.595	-0.345	0.000	0.51		517.2	OK
S1.013	S68	13.588	0.338	0.000	0.18		54.6	SURCHARGED
S1.014	S69	12.651	-0.296	0.000	0.26		54.6	OK
S17.000	S70	14.041	0.516	0.000	1.18		373.4	SURCHARGED
S17.001	S71	13.375	0.350	0.000	1.10		378.6	SURCHARGED
S17.002	S72	12.821	0.246	0.000	1.29		547.8	SURCHARGED
S17.003	S73	12.482	-0.368	0.000	0.72		546.4	OK
S17.004	S74	12.071	-0.029	0.000	0.01		0.3	OK
S1.015	S75	12.164	-0.268	0.000	0.13		50.0	OK
S1.016	S76	12.155	-0.135	0.000	0.18		49.9	OK
S1.017	S77	12.149	-0.501	0.000	0.06		49.8	OK
S18.000	S78	18.252	-0.113	0.000	0.50		20.0	OK
S18.001	S79	17.566	-0.063	0.000	0.87		35.0	OK
S18.002	S80	16.922	-0.008	0.000	0.60		45.0	OK
S18.003	S81	16.871	0.091	0.000	0.56		45.0	SURCHARGED
S18.004	S82	16.767	0.357	0.000	0.63		50.0	SURCHARGED
S18.005	S83	16.646	0.576	0.000	0.69		54.9	SURCHARGED
S18.006	S84	16.517	0.747	0.000	0.71		53.6	SURCHARGED
S19.000	S85	17.603	-0.070	0.000	0.56		10.0	OK
S19.001	S86	17.148	-0.069	0.000	0.57		10.0	OK
S19.002	S87	16.845	-0.060	0.000	0.63		10.0	OK
S19.003	S88	16.758	-0.067	0.000	0.51		25.0	OK
S19.004	S89	16.671	0.196	0.000	0.52		25.0	SURCHARGED
S19.005	S90	16.473	0.798	0.000	0.84		25.0	SURCHARGED
S18.007	S91	16.451	0.821	0.000	0.91		74.8	SURCHARGED
S20.000	S92	17.273	-0.172	0.000	0.13		5.0	OK
S20.001	S93	16.746	-0.169	0.000	0.14		5.0	OK
S20.002	S94	16.346	-0.199	0.000	0.03		5.0	OK

Summary of Results for 30 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S18.008	S95	15.831	0.941	0.000	1.15		94.3	SURCHARGED
S18.009	S96	15.015	0.735	0.000	1.25		99.1	SURCHARGED
S18.010	S97	14.578	0.578	0.000	1.33		103.9	SURCHARGED
S18.011	S98	14.186	0.406	0.000	1.52		108.7	SURCHARGED
S18.012	S99	13.474	-0.001	0.000	0.85		117.3	OK
S21.000	S100	14.824	-0.151	0.000	0.24		10.0	OK
S21.001	S101	14.189	-0.116	0.000	0.48		15.0	OK
S21.002	S102	14.124	-0.131	0.000	0.37		15.0	OK
S21.003	S103	13.844	-0.131	0.000	0.37		15.0	OK
S22.000	S104	14.923	-0.132	0.000	0.36		15.0	OK
S22.001	S105	14.306	-0.099	0.000	0.60		25.0	OK
S21.004	S106	13.498	-0.137	0.000	0.57		50.0	OK
S23.000	S107	15.850	-0.225	0.000	0.00		0.0	OK
S23.001	S108	13.220	-0.375	0.000	0.00		0.0	OK
S23.002	S109	12.960	-0.205	0.000	0.00		0.0	OK
S21.005	S110	12.960	-0.185	0.000	0.42		50.0	OK
S18.013	S111	12.852	0.227	0.000	1.41		165.7	SURCHARGED
S18.014	S112	12.326	-0.049	0.000	0.72		165.3	OK
S1.018	S113	12.147	-0.473	0.000	0.63		214.9	OK

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes SW PIPES Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	Add Flow / Climate Change (%)	40
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.450	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.000	17.966	0.125	143.7	0.890	8.00	0.0	0.600	o	525	
S1.001	79.485	0.265	299.9	0.865	0.00	0.0	0.600	o	600	
S2.000	104.530	1.000	104.5	0.952	8.00	0.0	0.600	o	675	
S2.001	35.691	0.215	166.0	0.975	0.00	0.0	0.600	o	750	
S2.002	79.737	0.320	249.2	0.204	0.00	0.0	0.600	o	750	
S1.002	61.629	0.185	333.1	0.446	0.00	0.0	0.600	o	800	
S1.003	51.618	0.230	224.4	0.000	0.00	0.0	0.600	o	800	
S1.004	13.469	0.068	198.1	0.000	0.00	0.0	0.600	o	800	
S1.005	12.368	0.062	199.5	0.000	0.00	0.0	0.600	o	800	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	100.00	8.16	17.400	0.890	0.0	0.0	96.4	1.87	404.0	337.4
S1.001	100.00	9.11	17.200	1.755	0.0	0.0	190.1	1.40	396.1«	665.4
S2.000	100.00	8.68	18.395	0.952	0.0	0.0	103.1	2.56	917.3	361.0
S2.001	100.00	8.95	17.320	1.927	0.0	0.0	208.8	2.17	958.4	730.6
S2.002	100.00	9.71	17.105	2.131	0.0	0.0	230.9	1.77	781.2«	808.0
S1.002	100.00	10.35	16.735	4.332	0.0	0.0	469.3	1.59	799.4«	1642.5
S1.003	100.00	10.79	16.550	4.332	0.0	0.0	469.3	1.94	975.3«	1642.5
S1.004	100.00	10.90	16.320	4.332	0.0	0.0	469.3	2.07	1038.6«	1642.5
S1.005	100.00	11.00	16.252	4.332	0.0	0.0	469.3	2.06	1034.9«	1642.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S3.000	25.768	0.170	151.6	0.286	8.00	0.0	0.600	o	300	
S3.001	22.011	0.110	200.1	0.162	0.00	0.0	0.600	o	300	
S1.006	66.006	0.290	227.6	0.000	0.00	0.0	0.600	o	800	
S1.007	18.446	0.070	263.5	0.000	0.00	0.0	0.600	o	800	
S1.008	130.205	0.500	260.4	0.000	0.00	0.0	0.600	o	800	
S1.009	13.328	0.040	333.2	0.000	0.00	0.0	0.600	o	875	
S1.010	136.349	0.990	137.7	0.000	0.00	0.0	0.600	o	1000	
S4.000	129.886	0.795	163.4	1.173	8.00	0.0	0.600	o	525	
S5.000	69.831	0.520	134.3	1.085	8.00	0.0	0.600	o	600	
S4.001	43.224	0.198	218.3	0.077	0.00	0.0	0.600	o	600	
S4.002	6.272	0.132	47.5	0.405	0.00	0.0	0.600	o	600	
S4.003	44.802	1.990	22.5	0.000	0.00	0.0	0.600	o	600	
S6.000	99.776	0.500	199.6	0.246	8.00	0.0	0.600	o	300	
S7.000	51.619	0.258	200.1	0.398	8.00	0.0	0.600	o	375	
S7.001	64.724	0.324	199.8	0.000	0.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	100.00	8.34	16.970	0.286	0.0	0.0	31.0	1.27	90.1«	108.4
S3.001	100.00	8.67	16.800	0.448	0.0	0.0	48.5	1.11	78.3«	169.9
S1.006	100.00	11.57	16.190	4.780	0.0	0.0	517.8	1.93	968.4«	1812.4
S1.007	100.00	11.75	15.900	4.780	0.0	0.0	517.8	1.79	899.6«	1812.4
S1.008	100.00	12.95	15.830	4.780	0.0	0.0	517.8	1.80	905.0«	1812.4
S1.009	100.00	13.08	15.255	4.780	0.0	0.0	517.8	1.68	1011.0«	1812.4
S1.010	100.00	13.88	15.215	4.780	0.0	0.0	517.8	2.85	2236.7	1812.4
S4.000	100.00	9.24	18.750	1.173	0.0	0.0	127.1	1.75	378.8«	444.7
S5.000	100.00	8.55	18.400	1.085	0.0	0.0	117.5	2.10	593.7	411.4
S4.001	100.00	9.68	17.880	2.335	0.0	0.0	253.0	1.64	464.9«	885.3
S4.002	100.00	9.70	17.682	2.740	0.0	0.0	296.8	3.54	1000.6«	1038.9
S4.003	100.00	9.85	17.550	2.740	0.0	0.0	296.8	5.15	1455.3	1038.9
S6.000	100.00	9.50	18.719	0.246	0.0	0.0	26.6	1.11	78.4«	93.3
S7.000	100.00	8.67	19.100	0.398	0.0	0.0	43.1	1.28	141.1«	150.9
S7.001	100.00	9.52	18.842	0.398	0.0	0.0	43.1	1.28	141.2«	150.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S7.002	43.463	0.217	200.3	0.000	0.00	0.0	0.600	o	375	
S7.003	28.540	0.157	181.8	0.000	0.00	0.0	0.600	o	375	
S6.001	80.238	0.300	267.5	0.000	0.00	0.0	0.600	o	600	
S6.002	3.433	0.179	19.2	0.000	0.00	0.0	0.600	o	600	
S6.003	61.378	0.780	78.7	1.316	0.00	0.0	0.600	o	680	
S6.004	6.371	0.020	318.6	0.000	0.00	0.0	0.600	o	680	
S6.005	40.521	0.110	368.4	0.000	0.00	0.0	0.600	o	750	
S8.000	55.053	0.300	183.5	0.161	8.00	0.0	0.600	o	450	
S8.001	100.444	0.300	334.8	0.504	0.00	0.0	0.600	o	450	
S8.002	7.271	0.120	60.6	0.000	0.00	0.0	0.600	o	450	
S6.006	49.044	1.040	47.2	0.000	0.00	0.0	0.600	o	750	
S4.004	73.185	0.290	252.4	0.280	0.00	0.0	0.600	[]	1	
S4.005	126.298	0.400	315.7	0.000	0.00	0.0	0.600	o	1000	
S9.000	63.403	0.238	266.4	0.075	8.00	0.0	0.600	o	375	
S9.001	6.518	0.022	296.3	0.000	0.00	0.0	0.600	o	375	
S9.002	62.164	0.185	336.0	0.784	0.00	0.0	0.600	o	450	
S9.003	68.571	0.230	298.1	0.353	0.00	0.0	0.600	o	750	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.002	100.00	10.08	18.518	0.398	0.0	0.0	43.1	1.28	141.0«	150.9
S7.003	100.00	10.44	18.301	0.398	0.0	0.0	43.1	1.34	148.1«	150.9
S6.001	100.00	11.34	17.919	0.644	0.0	0.0	69.8	1.48	419.7	244.2
S6.002	100.00	11.35	17.619	0.644	0.0	0.0	69.8	5.58	1577.0	244.2
S6.003	100.00	11.70	17.360	1.960	0.0	0.0	212.3	2.97	1078.6	743.1
S6.004	100.00	11.77	16.580	1.960	0.0	0.0	212.3	1.47	533.8«	743.1
S6.005	100.00	12.23	16.560	1.960	0.0	0.0	212.3	1.45	641.5«	743.1
S8.000	100.00	8.61	17.470	0.161	0.0	0.0	17.4	1.50	238.2	61.0
S8.001	100.00	10.13	17.170	0.665	0.0	0.0	72.0	1.11	175.8«	252.1
S8.002	100.00	10.17	16.870	0.665	0.0	0.0	72.0	2.62	416.0	252.1
S6.006	100.00	12.43	16.450	2.625	0.0	0.0	284.4	4.08	1803.1	995.3
S4.004	100.00	13.08	15.410	5.645	0.0	0.0	611.5	1.88	1292.6«	2140.3
S4.005	100.00	14.20	15.300	5.645	0.0	0.0	611.5	1.88	1473.8«	2140.3
S9.000	100.00	8.96	17.190	0.075	0.0	0.0	8.1	1.11	122.1	28.4
S9.001	100.00	9.06	16.952	0.075	0.0	0.0	8.1	1.05	115.7	28.4
S9.002	100.00	10.00	16.855	0.859	0.0	0.0	93.1	1.10	175.5«	325.7
S9.003	100.00	10.71	16.370	1.212	0.0	0.0	131.3	1.62	713.7	459.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S10.000	86.241	0.287	300.5	1.118	8.00	0.0	0.600	o	450	
S10.001	23.031	0.085	271.0	0.000	0.00	0.0	0.600	o	450	
S9.004	40.000	0.130	307.7	0.244	0.00	0.0	0.600	o	750	
S9.005	81.776	0.495	165.2	0.000	0.00	0.0	0.600	o	750	
S9.006	65.659	0.265	247.8	0.000	0.00	0.0	0.600	oo	525	
S9.007	6.999	0.030	233.3	0.412	0.00	0.0	0.600	ooo	525	
S11.000	66.317	0.660	100.5	0.282	8.00	0.0	0.600	o	525	
S9.008	8.392	0.030	279.7	0.000	0.00	0.0	0.600	ooo	525	
S9.009	44.429	0.150	296.2	0.000	0.00	0.0	0.600	ooo	525	
S9.010	54.698	0.190	287.9	0.476	0.00	0.0	0.600	ooo	525	
S9.011	4.281	0.020	214.1	0.000	0.00	0.0	0.600	ooo	525	
S9.012	105.226	0.200	526.1	0.000	0.00	0.0	0.600	o	1000	
S12.000	77.655	0.311	249.7	1.969	8.00	0.0	0.600	o	750	
S12.001	104.843	0.200	524.2	0.000	0.00	0.0	0.600	o	1000	
S13.000	19.206	0.230	83.5	0.177	8.00	0.0	0.600	o	450	
S13.001	69.246	0.745	92.9	0.000	0.00	0.0	0.600	o	450	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S10.000	100.00	9.23	16.812	1.118	0.0	0.0	121.1	1.17	185.7«	423.9
S10.001	100.00	9.54	16.525	1.118	0.0	0.0	121.1	1.23	195.7«	423.9
S9.004	100.00	11.13	16.140	2.574	0.0	0.0	278.8	1.59	702.5«	975.9
S9.005	100.00	11.75	16.010	2.574	0.0	0.0	278.8	2.17	960.7«	975.9
S9.006	100.00	12.52	15.740	2.574	0.0	0.0	278.8	1.42	614.1«	975.9
S9.007	100.00	12.60	15.520	2.986	0.0	0.0	323.5	1.46	949.5«	1132.2
S11.000	100.00	8.49	16.150	0.282	0.0	0.0	30.5	2.23	483.7	106.9
S9.008	100.00	12.71	15.490	3.268	0.0	0.0	354.0	1.33	866.5«	1239.1
S9.009	100.00	13.28	15.460	3.268	0.0	0.0	354.0	1.30	841.8«	1239.1
S9.010	100.00	13.97	15.310	3.744	0.0	0.0	405.6	1.32	854.0«	1419.6
S9.011	100.00	14.02	15.120	3.744	0.0	0.0	405.6	1.53	991.7«	1419.6
S9.012	100.00	15.23	15.100	3.744	0.0	0.0	405.6	1.45	1139.5«	1419.6
S12.000	100.00	8.73	15.200	1.969	0.0	0.0	213.3	1.77	780.4	746.6
S12.001	100.00	9.93	15.100	1.969	0.0	0.0	213.3	1.45	1141.6	746.6
S13.000	100.00	8.14	17.010	0.177	0.0	0.0	19.2	2.23	354.1	67.1
S13.001	100.00	8.69	16.780	0.177	0.0	0.0	19.2	2.11	335.5	67.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S13.002	97.217	0.570	170.6	1.098	0.00	0.0	0.600	o	525	
S13.003	24.661	0.090	274.0	0.000	0.00	0.0	0.600	o	525	
S13.004	204.153	0.400	510.4	0.000	0.00	0.0	0.600	o	1000	
S14.000	25.044	0.039	642.1	0.697	8.00	0.0	0.600	o	525	
S14.001	146.187	0.426	343.2	1.313	0.00	0.0	0.600	o	1000	
S1.011	219.264	0.360	609.1	0.370	0.00	0.0	0.600	o	1000	
S15.000	72.359	0.449	161.2	1.079	8.00	0.0	0.600	o	450	
S16.000	56.376	0.606	93.0	0.232	8.00	0.0	0.600	o	300	
S15.001	7.451	0.075	99.3	0.000	0.00	0.0	0.600	o	525	
S1.012	231.624	0.390	593.9	0.658	0.00	0.0	0.600	o	1000	
S1.013	18.790	0.303	62.0	0.000	0.00	0.0	0.600	o	450	
S1.014	107.105	0.515	208.0	0.000	0.00	0.0	0.600	o	450	
S17.000	104.533	0.500	209.1	1.280	8.00	0.0	0.600	o	525	
S17.001	76.774	0.450	170.6	0.081	0.00	0.0	0.600	o	525	
S17.002	37.514	0.200	187.6	0.729	0.00	0.0	0.600	o	600	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S13.002	100.00	9.64	15.960	1.275	0.0	0.0	138.1	1.71	370.7«	483.4
S13.003	100.00	9.94	15.390	1.275	0.0	0.0	138.1	1.35	291.9«	483.4
S13.004	100.00	12.25	15.300	1.275	0.0	0.0	138.1	1.47	1157.1	483.4
S14.000	100.00	8.48	15.370	0.697	0.0	0.0	75.5	0.88	189.7«	264.3
S14.001	100.00	9.83	15.330	2.010	0.0	0.0	217.7	1.80	1413.3	762.1
S1.011	92.31	17.94	13.300	19.793	0.0	0.0	1979.3	1.35	1058.4«	6927.4
S15.000	100.00	8.75	13.524	1.079	0.0	0.0	116.9	1.60	254.3«	409.1
S16.000	100.00	8.58	13.831	0.232	0.0	0.0	25.1	1.63	115.3	88.0
S15.001	100.00	8.81	13.000	1.311	0.0	0.0	142.0	2.25	486.5«	497.1
S1.012	84.23	20.77	12.940	21.762	0.0	0.0	1985.8	1.36	1071.9«	6950.3
S1.013	83.92	20.89	12.800	21.762	0.0	0.0	1985.8	2.59	411.2«	6950.3
S1.014	80.82	22.16	12.497	21.762	0.0	0.0	1985.8	1.41	223.6«	6950.3
S17.000	100.00	9.13	13.000	1.280	0.0	0.0	138.7	1.55	334.5«	485.3
S17.001	100.00	9.87	12.500	1.361	0.0	0.0	147.4	1.71	370.6«	516.0
S17.002	100.00	10.23	11.975	2.090	0.0	0.0	226.4	1.77	501.8«	792.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S17.003	30.729	0.050	614.6	0.000	0.00	0.0	0.600	o	1000	
S17.004	4.539	0.020	226.9	0.000	0.00	0.0	0.600	o	300	
S1.015	14.656	0.142	103.2	0.000	0.00	0.0	0.600	o	600	
S1.016	8.662	0.040	216.5	0.000	0.00	0.0	0.600	o	600	
S1.017	12.722	0.040	318.1	0.000	0.00	0.0	0.600	o	1000	
S18.000	117.749	0.736	160.0	0.000	8.00	20.0	0.600	o	225	
S18.001	111.766	0.699	159.9	0.000	0.00	15.0	0.600	o	225	
S18.002	26.453	0.150	176.4	0.000	0.00	10.0	0.600	o	300	
S18.003	64.485	0.370	174.3	0.000	0.00	0.0	0.600	o	300	
S18.004	59.956	0.340	176.3	0.000	0.00	5.0	0.600	o	300	
S18.005	52.143	0.300	173.8	0.000	0.00	5.0	0.600	o	300	
S18.006	24.212	0.140	172.9	0.000	0.00	0.0	0.600	o	300	
S19.000	42.461	0.456	93.1	0.000	8.00	10.0	0.600	o	150	
S19.001	29.038	0.312	93.1	0.000	0.00	0.0	0.600	o	150	
S19.002	7.458	0.080	93.2	0.000	0.00	0.0	0.600	o	150	
S19.003	34.547	0.350	98.7	0.000	0.00	15.0	0.600	o	225	
S19.004	88.659	0.800	110.8	0.000	0.00	0.0	0.600	o	225	
S19.005	6.492	0.045	144.3	0.000	0.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S17.003	100.00	10.61	11.850	2.090	0.0	0.0	226.4	1.34	1053.6	792.4
S17.004	100.00	10.68	11.800	2.090	0.0	0.0	226.4	1.04	73.5«	792.4
S1.015	80.58	22.26	11.832	23.852	0.0	0.0	2082.1	2.40	677.7«	7287.2
S1.016	80.38	22.35	11.690	23.852	0.0	0.0	2082.1	1.65	466.8«	7287.2
S1.017	80.11	22.46	11.650	23.852	0.0	0.0	2082.1	1.87	1468.4«	7287.2
S18.000	100.00	9.90	18.140	0.000	20.0	0.0	8.0	1.03	41.0	28.0
S18.001	100.00	11.71	17.404	0.000	35.0	0.0	14.0	1.03	41.0«	49.0
S18.002	100.00	12.08	16.630	0.000	45.0	0.0	18.0	1.18	83.5	63.0
S18.003	100.00	12.99	16.480	0.000	45.0	0.0	18.0	1.19	84.0	63.0
S18.004	100.00	13.83	16.110	0.000	50.0	0.0	20.0	1.18	83.5	70.0
S18.005	100.00	14.56	15.770	0.000	55.0	0.0	22.0	1.19	84.1	77.0
S18.006	100.00	14.90	15.470	0.000	55.0	0.0	22.0	1.19	84.3	77.0
S19.000	100.00	8.68	17.523	0.000	10.0	0.0	4.0	1.04	18.4	14.0
S19.001	100.00	9.14	17.067	0.000	10.0	0.0	4.0	1.04	18.4	14.0
S19.002	100.00	9.26	16.755	0.000	10.0	0.0	4.0	1.04	18.4	14.0
S19.003	100.00	9.70	16.600	0.000	25.0	0.0	10.0	1.32	52.3	35.0
S19.004	100.00	10.89	16.250	0.000	25.0	0.0	10.0	1.24	49.4	35.0
S19.005	100.00	10.99	15.450	0.000	25.0	0.0	10.0	1.09	43.2	35.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S18.007	128.495	0.740	173.6	0.000	0.00	0.0	0.600	o	300	
S20.000	85.961	0.530	162.2	0.000	8.00	5.0	0.600	o	225	
S20.001	74.193	0.370	200.5	0.000	0.00	0.0	0.600	o	225	
S20.002	11.170	1.655	6.7	0.000	0.00	0.0	0.600	o	225	
S18.008	105.664	0.610	173.2	0.000	0.00	15.0	0.600	o	300	
S18.009	48.123	0.280	171.9	0.000	0.00	5.0	0.600	o	300	
S18.010	38.176	0.220	173.5	0.000	0.00	5.0	0.600	o	300	
S18.011	67.097	0.305	220.0	0.000	0.00	5.0	0.600	o	300	
S18.012	169.773	0.850	199.7	0.000	0.00	10.0	0.600	o	375	
S21.000	99.686	0.670	148.8	0.000	8.00	10.0	0.600	o	225	
S21.001	7.183	0.050	143.7	0.000	0.00	5.0	0.600	o	225	
S21.002	41.289	0.280	147.5	0.000	0.00	0.0	0.600	o	225	
S21.003	51.231	0.340	150.7	0.000	0.00	0.0	0.600	o	225	
S22.000	96.242	0.650	148.1	0.000	8.00	15.0	0.600	o	225	
S22.001	114.435	0.770	148.6	0.000	0.00	10.0	0.600	o	225	
S21.004	72.684	0.490	148.3	0.000	0.00	10.0	0.600	o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S18.007	96.43	16.70	15.330	0.000	80.0	0.0	32.0	1.19	84.1«	112.0
S20.000	100.00	9.40	17.220	0.000	5.0	0.0	2.0	1.02	40.7	7.0
S20.001	100.00	10.74	16.690	0.000	5.0	0.0	2.0	0.92	36.6	7.0
S20.002	100.00	10.78	16.320	0.000	5.0	0.0	2.0	5.07	201.6	7.0
S18.008	91.56	18.18	14.590	0.000	100.0	0.0	40.0	1.19	84.2«	140.0
S18.009	89.52	18.85	13.980	0.000	105.0	0.0	42.0	1.20	84.6«	147.0
S18.010	87.98	19.38	13.700	0.000	110.0	0.0	44.0	1.19	84.2«	154.0
S18.011	85.08	20.44	13.480	0.000	115.0	0.0	46.0	1.06	74.6«	161.0
S18.012	79.67	22.66	13.100	0.000	125.0	0.0	50.0	1.28	141.2«	175.0
S21.000	100.00	9.55	14.750	0.000	10.0	0.0	4.0	1.07	42.5	14.0
S21.001	100.00	9.66	14.080	0.000	15.0	0.0	6.0	1.09	43.3	21.0
S21.002	100.00	10.30	14.030	0.000	15.0	0.0	6.0	1.07	42.7	21.0
S21.003	100.00	11.11	13.750	0.000	15.0	0.0	6.0	1.06	42.3	21.0
S22.000	100.00	9.50	14.830	0.000	15.0	0.0	6.0	1.07	42.6	21.0
S22.001	100.00	11.28	14.180	0.000	25.0	0.0	10.0	1.07	42.6	35.0
S21.004	100.00	12.22	13.335	0.000	50.0	0.0	20.0	1.29	91.1	70.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S23.000	101.423	2.480	40.9	0.000	8.00	0.0	0.600	o	225	
S23.001	154.404	0.430	359.1	0.000	0.00	0.0	0.600	o	375	
S23.002	4.870	0.020	243.5	0.000	0.00	0.0	0.600	o	375	
S21.005	134.423	0.520	258.5	0.000	0.00	0.0	0.600	o	375	
S18.013	63.087	0.250	252.3	0.000	0.00	0.0	0.600	o	375	
S18.014	5.657	0.340	16.6	0.000	0.00	0.0	0.600	o	375	
S1.018	17.396	0.019	915.6	0.000	0.00	0.0	0.600	o	1000	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S23.000	100.00	8.82	15.850	0.000	0.0	0.0	0.0	2.05	81.6	0.0
S23.001	100.00	11.53	13.220	0.000	0.0	0.0	0.0	0.95	105.0	0.0
S23.002	100.00	11.60	12.790	0.000	0.0	0.0	0.0	1.16	127.8	0.0
S21.005	100.00	14.21	12.770	0.000	50.0	0.0	20.0	1.12	123.9	70.0
S18.013	77.63	23.58	12.250	0.000	175.0	0.0	70.0	1.14	125.5«	245.0
S18.014	77.58	23.60	12.000	0.000	175.0	0.0	70.0	4.46	492.7	245.0
S1.018	77.02	23.87	11.620	23.852	175.0	0.0	2082.1	1.10	861.5«	7287.2

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	120
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	2

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D2 (1km)	0.258	Winter Storms	No
Return Period (years)	100	D3 (1km)	0.297	Cv (Summer)	0.750
Site Location		E (1km)	0.318	Cv (Winter)	0.840
C (1km)	-0.026	F (1km)	2.445	Storm Duration (mins)	60
D1 (1km)	0.314	Summer Storms	Yes		

Summary of Results for 60 minute 100 year Summer (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	19.733	1.808	0.000	0.90		244.0	SURCHARGED
S1.001	S2	19.667	1.867	0.000	1.29		467.0	SURCHARGED
S2.000	S3	19.627	0.557	0.000	0.32		269.7	SURCHARGED
S2.001	S4	19.550	1.480	0.000	0.63		458.8	SURCHARGED
S2.002	S5	19.477	1.622	0.000	0.69		481.8	SURCHARGED
S1.002	S6	19.328	1.793	0.000	1.47		1009.3	SURCHARGED
S1.003	S7	18.965	1.615	0.000	1.23		1010.5	SURCHARGED
S1.004	S8	18.636	1.516	0.000	1.57		1006.5	SURCHARGED
S1.005	S9	18.325	1.273	0.000	1.61		1000.9	SURCHARGED
S3.000	S10	18.320	1.050	0.000	0.97		78.2	SURCHARGED
S3.001	S11	18.204	1.104	0.000	1.84		127.2	SURCHARGED
S1.006	S12	18.011	1.021	0.000	1.29		1086.0	SURCHARGED
S1.007	S13	17.521	0.821	0.000	1.78		1083.0	SURCHARGED
S1.008	S14	17.143	0.513	0.000	1.28		1076.0	SURCHARGED
S1.009	S15	16.303	0.173	0.000	1.88		1069.7	FLOOD RISK
S1.010	S16	15.733	-0.482	0.000	0.53		1072.0	OK
S4.000	S17	19.972	0.697	0.000	0.92		334.0	SURCHARGED
S5.000	S18	19.432	0.432	0.000	0.58		311.6	SURCHARGED
S4.001	S19	19.251	0.771	0.000	1.65		660.1	SURCHARGED
S4.002	S20	18.695	0.413	0.000	2.04		742.8	SURCHARGED
S4.003	S21	17.886	-0.264	0.000	0.59		739.8	OK
S6.000	S22	19.018	-0.001	0.000	1.00		76.0	OK
S7.000	S23	19.394	-0.081	0.000	0.94		123.2	OK
S7.001	S24	19.130	-0.087	0.000	0.93		123.8	OK
S7.002	S25	18.809	-0.084	0.000	0.95		122.3	OK
S7.003	S26	18.587	-0.089	0.000	0.94		122.5	OK
S6.001	S27	18.223	-0.296	0.000	0.51		195.2	OK
S6.002	S28	17.906	-0.313	0.000	0.45		191.9	OK
S6.003	S29	17.771	-0.269	0.000	0.59		557.6	OK
S6.004	S30	17.494	0.234	0.000	2.07		548.4	SURCHARGED
S6.005	S31	17.310	0.000	0.000	1.04		544.6	OK
S8.000	S32	17.771	-0.149	0.000	0.23		50.0	OK
S8.001	S33	17.743	0.123	0.000	1.16		194.5	SURCHARGED
S8.002	S34	17.228	-0.092	0.000	0.99		192.7	OK
S6.006	S35	17.104	-0.096	0.000	0.47		719.7	OK
S4.004	S36	16.870	0.860	0.000	1.33		1495.8	SURCHARGED
S4.005	S37	16.360	0.060	0.000	1.13		1499.4	FLOOD RISK
S9.000	S38	17.626	0.061	0.000	0.20		23.5	SURCHARGED
S9.001	S39	17.604	0.277	0.000	0.50		37.8	SURCHARGED
S9.002	S40	17.597	0.292	0.000	1.59		258.0	SURCHARGED
S9.003	S41	17.136	0.016	0.000	0.53		334.8	SURCHARGED
S10.000	S42	18.380	1.118	0.000	1.90		332.3	SURCHARGED
S10.001	S43	17.381	0.406	0.000	2.04		329.7	SURCHARGED
S9.004	S44	17.090	0.200	0.000	1.23		706.6	SURCHARGED
S9.005	S45	16.931	0.171	0.000	0.77		662.4	SURCHARGED

Summary of Results for 60 minute 100 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S9.006	S46	16.661	0.396	0.000	1.13		636.7	SURCHARGED
S9.007	S47	16.329	0.284	0.000	1.22		686.5	FLOOD RISK
S11.000	S48	16.323	-0.352	0.000	0.20		88.7	OK
S9.008	S49	16.286	0.271	0.000	1.36		739.3	FLOOD RISK
S9.009	S50	16.233	0.248	0.000	0.99		734.4	FLOOD RISK
S9.010	S51	16.087	0.252	0.000	1.02		783.1	FLOOD RISK
S9.011	S52	15.886	0.241	0.000	1.59		782.6	SURCHARGED
S9.012	S53	15.768	-0.332	0.000	0.78		785.7	OK
S12.000	S54	15.897	-0.053	0.000	0.87		603.2	OK
S12.001	S55	15.654	-0.446	0.000	0.59		600.4	OK
S13.000	S56	17.149	-0.311	0.000	0.21		56.2	OK
S13.001	S57	16.908	-0.322	0.000	0.18		55.1	OK
S13.002	S58	16.752	0.267	0.000	1.09		381.4	SURCHARGED
S13.003	S59	16.043	0.128	0.000	1.60		377.7	SURCHARGED
S13.004	S60	15.708	-0.592	0.000	0.35		377.3	OK
S14.000	S61	15.923	0.028	0.000	1.59		217.3	SURCHARGED
S14.001	S62	15.827	-0.503	0.000	0.49		630.2	OK
S1.011	S63	15.113	0.813	0.000	0.05		53.0	SURCHARGED
S15.000	S64	14.761	0.787	0.000	1.39		330.5	SURCHARGED
S16.000	S65	14.118	-0.013	0.000	0.63		69.3	OK
S15.001	S66	13.875	0.350	0.000	1.60		397.1	SURCHARGED
S1.012	S67	13.687	-0.253	0.000	0.53		539.8	OK
S1.013	S68	13.680	0.430	0.000	0.18		54.6	SURCHARGED
S1.014	S69	12.651	-0.296	0.000	0.26		54.6	OK
S17.000	S70	14.070	0.545	0.000	1.17		369.2	SURCHARGED
S17.001	S71	13.387	0.362	0.000	1.10		377.5	SURCHARGED
S17.002	S72	12.842	0.267	0.000	1.29		548.1	SURCHARGED
S17.003	S73	12.488	-0.362	0.000	0.73		549.9	OK
S17.004	S74	12.155	0.055	0.000	0.00		0.2	SURCHARGED
S1.015	S75	12.178	-0.254	0.000	0.14		53.6	OK
S1.016	S76	12.168	-0.122	0.000	0.19		53.6	OK
S1.017	S77	12.162	-0.488	0.000	0.07		53.5	OK
S18.000	S78	18.252	-0.113	0.000	0.50		20.0	OK
S18.001	S79	17.826	0.197	0.000	0.87		35.0	SURCHARGED
S18.002	S80	17.308	0.378	0.000	0.60		45.0	SURCHARGED
S18.003	S81	17.256	0.476	0.000	0.56		45.0	SURCHARGED
S18.004	S82	17.144	0.734	0.000	0.63		50.0	SURCHARGED
S18.005	S83	17.014	0.944	0.000	0.69		54.9	SURCHARGED
S18.006	S84	16.875	1.105	0.000	0.72		53.9	SURCHARGED
S19.000	S85	17.603	-0.070	0.000	0.56		10.0	OK
S19.001	S86	17.253	0.036	0.000	0.57		10.0	SURCHARGED
S19.002	S87	17.155	0.250	0.000	0.63		10.0	SURCHARGED
S19.003	S88	17.125	0.300	0.000	0.51		25.0	SURCHARGED
S19.004	S89	17.036	0.561	0.000	0.52		25.0	SURCHARGED
S19.005	S90	16.827	1.152	0.000	0.84		25.0	SURCHARGED
S18.007	S91	16.802	1.172	0.000	0.96		78.4	SURCHARGED
S20.000	S92	17.273	-0.172	0.000	0.13		5.0	OK
S20.001	S93	16.746	-0.169	0.000	0.14		5.0	OK
S20.002	S94	16.346	-0.199	0.000	0.03		5.0	OK

Summary of Results for 60 minute 100 year Summer (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S18.008	S95	16.126	1.236	0.000	1.20		98.3	SURCHARGED
S18.009	S96	15.243	0.963	0.000	1.30		103.3	SURCHARGED
S18.010	S97	14.770	0.770	0.000	1.39		108.2	SURCHARGED
S18.011	S98	14.346	0.566	0.000	1.59		113.2	SURCHARGED
S18.012	S99	13.577	0.102	0.000	0.89		122.9	SURCHARGED
S21.000	S100	14.824	-0.151	0.000	0.24		10.0	OK
S21.001	S101	14.189	-0.116	0.000	0.48		15.0	OK
S21.002	S102	14.124	-0.131	0.000	0.37		15.0	OK
S21.003	S103	13.844	-0.131	0.000	0.37		15.0	OK
S22.000	S104	14.923	-0.132	0.000	0.36		15.0	OK
S22.001	S105	14.306	-0.099	0.000	0.60		25.0	OK
S21.004	S106	13.498	-0.137	0.000	0.57		50.0	OK
S23.000	S107	15.850	-0.225	0.000	0.00		0.0	OK
S23.001	S108	13.220	-0.375	0.000	0.00		0.0	OK
S23.002	S109	12.989	-0.176	0.000	0.00		0.0	OK
S21.005	S110	12.989	-0.156	0.000	0.42		50.0	OK
S18.013	S111	12.900	0.275	0.000	1.46		172.5	SURCHARGED
S18.014	S112	12.353	-0.022	0.000	0.76		172.4	OK
S1.018	S113	12.159	-0.461	0.000	0.66		225.8	OK

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes SW PIPES Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	Add Flow / Climate Change (%)	40
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.450	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S1.000	17.966	0.125	143.7	0.890	8.00	0.0	0.600	o	525	
S1.001	79.485	0.265	299.9	0.865	0.00	0.0	0.600	o	600	
S2.000	104.530	1.000	104.5	0.952	8.00	0.0	0.600	o	675	
S2.001	35.691	0.215	166.0	0.975	0.00	0.0	0.600	o	750	
S2.002	79.737	0.320	249.2	0.204	0.00	0.0	0.600	o	750	
S1.002	61.629	0.185	333.1	0.446	0.00	0.0	0.600	o	800	
S1.003	51.618	0.230	224.4	0.000	0.00	0.0	0.600	o	800	
S1.004	13.469	0.068	198.1	0.000	0.00	0.0	0.600	o	800	
S1.005	12.368	0.062	199.5	0.000	0.00	0.0	0.600	o	800	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	100.00	8.16	17.400	0.890	0.0	0.0	96.4	1.87	404.0	337.4
S1.001	100.00	9.11	17.200	1.755	0.0	0.0	190.1	1.40	396.1«	665.4
S2.000	100.00	8.68	18.395	0.952	0.0	0.0	103.1	2.56	917.3	361.0
S2.001	100.00	8.95	17.320	1.927	0.0	0.0	208.8	2.17	958.4	730.6
S2.002	100.00	9.71	17.105	2.131	0.0	0.0	230.9	1.77	781.2«	808.0
S1.002	100.00	10.35	16.735	4.332	0.0	0.0	469.3	1.59	799.4«	1642.5
S1.003	100.00	10.79	16.550	4.332	0.0	0.0	469.3	1.94	975.3«	1642.5
S1.004	100.00	10.90	16.320	4.332	0.0	0.0	469.3	2.07	1038.6«	1642.5
S1.005	100.00	11.00	16.252	4.332	0.0	0.0	469.3	2.06	1034.9«	1642.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S3.000	25.768	0.170	151.6	0.286	8.00	0.0	0.600	o	300	
S3.001	22.011	0.110	200.1	0.162	0.00	0.0	0.600	o	300	
S1.006	66.006	0.290	227.6	0.000	0.00	0.0	0.600	o	800	
S1.007	18.446	0.070	263.5	0.000	0.00	0.0	0.600	o	800	
S1.008	130.205	0.500	260.4	0.000	0.00	0.0	0.600	o	800	
S1.009	13.328	0.040	333.2	0.000	0.00	0.0	0.600	o	875	
S1.010	136.349	0.990	137.7	0.000	0.00	0.0	0.600	o	1000	
S4.000	129.886	0.795	163.4	1.173	8.00	0.0	0.600	o	525	
S5.000	69.831	0.520	134.3	1.085	8.00	0.0	0.600	o	600	
S4.001	43.224	0.198	218.3	0.077	0.00	0.0	0.600	o	600	
S4.002	6.272	0.132	47.5	0.405	0.00	0.0	0.600	o	600	
S4.003	44.802	1.990	22.5	0.000	0.00	0.0	0.600	o	600	
S6.000	99.776	0.500	199.6	0.246	8.00	0.0	0.600	o	300	
S7.000	51.619	0.258	200.1	0.398	8.00	0.0	0.600	o	375	
S7.001	64.724	0.324	199.8	0.000	0.00	0.0	0.600	o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	100.00	8.34	16.970	0.286	0.0	0.0	31.0	1.27	90.1«	108.4
S3.001	100.00	8.67	16.800	0.448	0.0	0.0	48.5	1.11	78.3«	169.9
S1.006	100.00	11.57	16.190	4.780	0.0	0.0	517.8	1.93	968.4«	1812.4
S1.007	100.00	11.75	15.900	4.780	0.0	0.0	517.8	1.79	899.6«	1812.4
S1.008	100.00	12.95	15.830	4.780	0.0	0.0	517.8	1.80	905.0«	1812.4
S1.009	100.00	13.08	15.255	4.780	0.0	0.0	517.8	1.68	1011.0«	1812.4
S1.010	100.00	13.88	15.215	4.780	0.0	0.0	517.8	2.85	2236.7	1812.4
S4.000	100.00	9.24	18.750	1.173	0.0	0.0	127.1	1.75	378.8«	444.7
S5.000	100.00	8.55	18.400	1.085	0.0	0.0	117.5	2.10	593.7	411.4
S4.001	100.00	9.68	17.880	2.335	0.0	0.0	253.0	1.64	464.9«	885.3
S4.002	100.00	9.70	17.682	2.740	0.0	0.0	296.8	3.54	1000.6«	1038.9
S4.003	100.00	9.85	17.550	2.740	0.0	0.0	296.8	5.15	1455.3	1038.9
S6.000	100.00	9.50	18.719	0.246	0.0	0.0	26.6	1.11	78.4«	93.3
S7.000	100.00	8.67	19.100	0.398	0.0	0.0	43.1	1.28	141.1«	150.9
S7.001	100.00	9.52	18.842	0.398	0.0	0.0	43.1	1.28	141.2«	150.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S7.002	43.463	0.217	200.3	0.000	0.00	0.0	0.600	o	375	
S7.003	28.540	0.157	181.8	0.000	0.00	0.0	0.600	o	375	
S6.001	80.238	0.300	267.5	0.000	0.00	0.0	0.600	o	600	
S6.002	3.433	0.179	19.2	0.000	0.00	0.0	0.600	o	600	
S6.003	61.378	0.780	78.7	1.316	0.00	0.0	0.600	o	680	
S6.004	6.371	0.020	318.6	0.000	0.00	0.0	0.600	o	680	
S6.005	40.521	0.110	368.4	0.000	0.00	0.0	0.600	o	750	
S8.000	55.053	0.300	183.5	0.161	8.00	0.0	0.600	o	450	
S8.001	100.444	0.300	334.8	0.504	0.00	0.0	0.600	o	450	
S8.002	7.271	0.120	60.6	0.000	0.00	0.0	0.600	o	450	
S6.006	49.044	1.040	47.2	0.000	0.00	0.0	0.600	o	750	
S4.004	73.185	0.290	252.4	0.280	0.00	0.0	0.600	[]	1	
S4.005	126.298	0.400	315.7	0.000	0.00	0.0	0.600	o	1000	
S9.000	63.403	0.238	266.4	0.075	8.00	0.0	0.600	o	375	
S9.001	6.518	0.022	296.3	0.000	0.00	0.0	0.600	o	375	
S9.002	62.164	0.185	336.0	0.784	0.00	0.0	0.600	o	450	
S9.003	68.571	0.230	298.1	0.353	0.00	0.0	0.600	o	750	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.002	100.00	10.08	18.518	0.398	0.0	0.0	43.1	1.28	141.0«	150.9
S7.003	100.00	10.44	18.301	0.398	0.0	0.0	43.1	1.34	148.1«	150.9
S6.001	100.00	11.34	17.919	0.644	0.0	0.0	69.8	1.48	419.7	244.2
S6.002	100.00	11.35	17.619	0.644	0.0	0.0	69.8	5.58	1577.0	244.2
S6.003	100.00	11.70	17.360	1.960	0.0	0.0	212.3	2.97	1078.6	743.1
S6.004	100.00	11.77	16.580	1.960	0.0	0.0	212.3	1.47	533.8«	743.1
S6.005	100.00	12.23	16.560	1.960	0.0	0.0	212.3	1.45	641.5«	743.1
S8.000	100.00	8.61	17.470	0.161	0.0	0.0	17.4	1.50	238.2	61.0
S8.001	100.00	10.13	17.170	0.665	0.0	0.0	72.0	1.11	175.8«	252.1
S8.002	100.00	10.17	16.870	0.665	0.0	0.0	72.0	2.62	416.0	252.1
S6.006	100.00	12.43	16.450	2.625	0.0	0.0	284.4	4.08	1803.1	995.3
S4.004	100.00	13.08	15.410	5.645	0.0	0.0	611.5	1.88	1292.6«	2140.3
S4.005	100.00	14.20	15.300	5.645	0.0	0.0	611.5	1.88	1473.8«	2140.3
S9.000	100.00	8.96	17.190	0.075	0.0	0.0	8.1	1.11	122.1	28.4
S9.001	100.00	9.06	16.952	0.075	0.0	0.0	8.1	1.05	115.7	28.4
S9.002	100.00	10.00	16.855	0.859	0.0	0.0	93.1	1.10	175.5«	325.7
S9.003	100.00	10.71	16.370	1.212	0.0	0.0	131.3	1.62	713.7	459.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S10.000	86.241	0.287	300.5	1.118	8.00	0.0	0.600	o	450	
S10.001	23.031	0.085	271.0	0.000	0.00	0.0	0.600	o	450	
S9.004	40.000	0.130	307.7	0.244	0.00	0.0	0.600	o	750	
S9.005	81.776	0.495	165.2	0.000	0.00	0.0	0.600	o	750	
S9.006	65.659	0.265	247.8	0.000	0.00	0.0	0.600	oo	525	
S9.007	6.999	0.030	233.3	0.412	0.00	0.0	0.600	ooo	525	
S11.000	66.317	0.660	100.5	0.282	8.00	0.0	0.600	o	525	
S9.008	8.392	0.030	279.7	0.000	0.00	0.0	0.600	ooo	525	
S9.009	44.429	0.150	296.2	0.000	0.00	0.0	0.600	ooo	525	
S9.010	54.698	0.190	287.9	0.476	0.00	0.0	0.600	ooo	525	
S9.011	4.281	0.020	214.1	0.000	0.00	0.0	0.600	ooo	525	
S9.012	105.226	0.200	526.1	0.000	0.00	0.0	0.600	o	1000	
S12.000	77.655	0.311	249.7	1.969	8.00	0.0	0.600	o	750	
S12.001	104.843	0.200	524.2	0.000	0.00	0.0	0.600	o	1000	
S13.000	19.206	0.230	83.5	0.177	8.00	0.0	0.600	o	450	
S13.001	69.246	0.745	92.9	0.000	0.00	0.0	0.600	o	450	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S10.000	100.00	9.23	16.812	1.118	0.0	0.0	121.1	1.17	185.7«	423.9
S10.001	100.00	9.54	16.525	1.118	0.0	0.0	121.1	1.23	195.7«	423.9
S9.004	100.00	11.13	16.140	2.574	0.0	0.0	278.8	1.59	702.5«	975.9
S9.005	100.00	11.75	16.010	2.574	0.0	0.0	278.8	2.17	960.7«	975.9
S9.006	100.00	12.52	15.740	2.574	0.0	0.0	278.8	1.42	614.1«	975.9
S9.007	100.00	12.60	15.520	2.986	0.0	0.0	323.5	1.46	949.5«	1132.2
S11.000	100.00	8.49	16.150	0.282	0.0	0.0	30.5	2.23	483.7	106.9
S9.008	100.00	12.71	15.490	3.268	0.0	0.0	354.0	1.33	866.5«	1239.1
S9.009	100.00	13.28	15.460	3.268	0.0	0.0	354.0	1.30	841.8«	1239.1
S9.010	100.00	13.97	15.310	3.744	0.0	0.0	405.6	1.32	854.0«	1419.6
S9.011	100.00	14.02	15.120	3.744	0.0	0.0	405.6	1.53	991.7«	1419.6
S9.012	100.00	15.23	15.100	3.744	0.0	0.0	405.6	1.45	1139.5«	1419.6
S12.000	100.00	8.73	15.200	1.969	0.0	0.0	213.3	1.77	780.4	746.6
S12.001	100.00	9.93	15.100	1.969	0.0	0.0	213.3	1.45	1141.6	746.6
S13.000	100.00	8.14	17.010	0.177	0.0	0.0	19.2	2.23	354.1	67.1
S13.001	100.00	8.69	16.780	0.177	0.0	0.0	19.2	2.11	335.5	67.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S13.002	97.217	0.570	170.6	1.098	0.00	0.0	0.600	o	525	
S13.003	24.661	0.090	274.0	0.000	0.00	0.0	0.600	o	525	
S13.004	204.153	0.400	510.4	0.000	0.00	0.0	0.600	o	1000	
S14.000	25.044	0.039	642.1	0.697	8.00	0.0	0.600	o	525	
S14.001	146.187	0.426	343.2	1.313	0.00	0.0	0.600	o	1000	
S1.011	219.264	0.360	609.1	0.370	0.00	0.0	0.600	o	1000	
S15.000	72.359	0.449	161.2	1.079	8.00	0.0	0.600	o	450	
S16.000	56.376	0.606	93.0	0.232	8.00	0.0	0.600	o	300	
S15.001	7.451	0.075	99.3	0.000	0.00	0.0	0.600	o	525	
S1.012	231.624	0.390	593.9	0.658	0.00	0.0	0.600	o	1000	
S1.013	18.790	0.303	62.0	0.000	0.00	0.0	0.600	o	450	
S1.014	107.105	0.515	208.0	0.000	0.00	0.0	0.600	o	450	
S17.000	104.533	0.500	209.1	1.280	8.00	0.0	0.600	o	525	
S17.001	76.774	0.450	170.6	0.081	0.00	0.0	0.600	o	525	
S17.002	37.514	0.200	187.6	0.729	0.00	0.0	0.600	o	600	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S13.002	100.00	9.64	15.960	1.275	0.0	0.0	138.1	1.71	370.7«	483.4
S13.003	100.00	9.94	15.390	1.275	0.0	0.0	138.1	1.35	291.9«	483.4
S13.004	100.00	12.25	15.300	1.275	0.0	0.0	138.1	1.47	1157.1	483.4
S14.000	100.00	8.48	15.370	0.697	0.0	0.0	75.5	0.88	189.7«	264.3
S14.001	100.00	9.83	15.330	2.010	0.0	0.0	217.7	1.80	1413.3	762.1
S1.011	92.31	17.94	13.300	19.793	0.0	0.0	1979.3	1.35	1058.4«	6927.4
S15.000	100.00	8.75	13.524	1.079	0.0	0.0	116.9	1.60	254.3«	409.1
S16.000	100.00	8.58	13.831	0.232	0.0	0.0	25.1	1.63	115.3	88.0
S15.001	100.00	8.81	13.000	1.311	0.0	0.0	142.0	2.25	486.5«	497.1
S1.012	84.23	20.77	12.940	21.762	0.0	0.0	1985.8	1.36	1071.9«	6950.3
S1.013	83.92	20.89	12.800	21.762	0.0	0.0	1985.8	2.59	411.2«	6950.3
S1.014	80.82	22.16	12.497	21.762	0.0	0.0	1985.8	1.41	223.6«	6950.3
S17.000	100.00	9.13	13.000	1.280	0.0	0.0	138.7	1.55	334.5«	485.3
S17.001	100.00	9.87	12.500	1.361	0.0	0.0	147.4	1.71	370.6«	516.0
S17.002	100.00	10.23	11.975	2.090	0.0	0.0	226.4	1.77	501.8«	792.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S17.003	30.729	0.050	614.6	0.000	0.00	0.0	0.600	o	1000	
S17.004	4.539	0.020	226.9	0.000	0.00	0.0	0.600	o	300	
S1.015	14.656	0.142	103.2	0.000	0.00	0.0	0.600	o	600	
S1.016	8.662	0.040	216.5	0.000	0.00	0.0	0.600	o	600	
S1.017	12.722	0.040	318.1	0.000	0.00	0.0	0.600	o	1000	
S18.000	117.749	0.736	160.0	0.000	8.00	20.0	0.600	o	225	
S18.001	111.766	0.699	159.9	0.000	0.00	15.0	0.600	o	225	
S18.002	26.453	0.150	176.4	0.000	0.00	10.0	0.600	o	300	
S18.003	64.485	0.370	174.3	0.000	0.00	0.0	0.600	o	300	
S18.004	59.956	0.340	176.3	0.000	0.00	5.0	0.600	o	300	
S18.005	52.143	0.300	173.8	0.000	0.00	5.0	0.600	o	300	
S18.006	24.212	0.140	172.9	0.000	0.00	0.0	0.600	o	300	
S19.000	42.461	0.456	93.1	0.000	8.00	10.0	0.600	o	150	
S19.001	29.038	0.312	93.1	0.000	0.00	0.0	0.600	o	150	
S19.002	7.458	0.080	93.2	0.000	0.00	0.0	0.600	o	150	
S19.003	34.547	0.350	98.7	0.000	0.00	15.0	0.600	o	225	
S19.004	88.659	0.800	110.8	0.000	0.00	0.0	0.600	o	225	
S19.005	6.492	0.045	144.3	0.000	0.00	0.0	0.600	o	225	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S17.003	100.00	10.61	11.850	2.090	0.0	0.0	226.4	1.34	1053.6	792.4
S17.004	100.00	10.68	11.800	2.090	0.0	0.0	226.4	1.04	73.5«	792.4
S1.015	80.58	22.26	11.832	23.852	0.0	0.0	2082.1	2.40	677.7«	7287.2
S1.016	80.38	22.35	11.690	23.852	0.0	0.0	2082.1	1.65	466.8«	7287.2
S1.017	80.11	22.46	11.650	23.852	0.0	0.0	2082.1	1.87	1468.4«	7287.2
S18.000	100.00	9.90	18.140	0.000	20.0	0.0	8.0	1.03	41.0	28.0
S18.001	100.00	11.71	17.404	0.000	35.0	0.0	14.0	1.03	41.0«	49.0
S18.002	100.00	12.08	16.630	0.000	45.0	0.0	18.0	1.18	83.5	63.0
S18.003	100.00	12.99	16.480	0.000	45.0	0.0	18.0	1.19	84.0	63.0
S18.004	100.00	13.83	16.110	0.000	50.0	0.0	20.0	1.18	83.5	70.0
S18.005	100.00	14.56	15.770	0.000	55.0	0.0	22.0	1.19	84.1	77.0
S18.006	100.00	14.90	15.470	0.000	55.0	0.0	22.0	1.19	84.3	77.0
S19.000	100.00	8.68	17.523	0.000	10.0	0.0	4.0	1.04	18.4	14.0
S19.001	100.00	9.14	17.067	0.000	10.0	0.0	4.0	1.04	18.4	14.0
S19.002	100.00	9.26	16.755	0.000	10.0	0.0	4.0	1.04	18.4	14.0
S19.003	100.00	9.70	16.600	0.000	25.0	0.0	10.0	1.32	52.3	35.0
S19.004	100.00	10.89	16.250	0.000	25.0	0.0	10.0	1.24	49.4	35.0
S19.005	100.00	10.99	15.450	0.000	25.0	0.0	10.0	1.09	43.2	35.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S18.007	128.495	0.740	173.6	0.000	0.00	0.0	0.600	o	300	
S20.000	85.961	0.530	162.2	0.000	8.00	5.0	0.600	o	225	
S20.001	74.193	0.370	200.5	0.000	0.00	0.0	0.600	o	225	
S20.002	11.170	1.655	6.7	0.000	0.00	0.0	0.600	o	225	
S18.008	105.664	0.610	173.2	0.000	0.00	15.0	0.600	o	300	
S18.009	48.123	0.280	171.9	0.000	0.00	5.0	0.600	o	300	
S18.010	38.176	0.220	173.5	0.000	0.00	5.0	0.600	o	300	
S18.011	67.097	0.305	220.0	0.000	0.00	5.0	0.600	o	300	
S18.012	169.773	0.850	199.7	0.000	0.00	10.0	0.600	o	375	
S21.000	99.686	0.670	148.8	0.000	8.00	10.0	0.600	o	225	
S21.001	7.183	0.050	143.7	0.000	0.00	5.0	0.600	o	225	
S21.002	41.289	0.280	147.5	0.000	0.00	0.0	0.600	o	225	
S21.003	51.231	0.340	150.7	0.000	0.00	0.0	0.600	o	225	
S22.000	96.242	0.650	148.1	0.000	8.00	15.0	0.600	o	225	
S22.001	114.435	0.770	148.6	0.000	0.00	10.0	0.600	o	225	
S21.004	72.684	0.490	148.3	0.000	0.00	10.0	0.600	o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S18.007	96.43	16.70	15.330	0.000	80.0	0.0	32.0	1.19	84.1«	112.0
S20.000	100.00	9.40	17.220	0.000	5.0	0.0	2.0	1.02	40.7	7.0
S20.001	100.00	10.74	16.690	0.000	5.0	0.0	2.0	0.92	36.6	7.0
S20.002	100.00	10.78	16.320	0.000	5.0	0.0	2.0	5.07	201.6	7.0
S18.008	91.56	18.18	14.590	0.000	100.0	0.0	40.0	1.19	84.2«	140.0
S18.009	89.52	18.85	13.980	0.000	105.0	0.0	42.0	1.20	84.6«	147.0
S18.010	87.98	19.38	13.700	0.000	110.0	0.0	44.0	1.19	84.2«	154.0
S18.011	85.08	20.44	13.480	0.000	115.0	0.0	46.0	1.06	74.6«	161.0
S18.012	79.67	22.66	13.100	0.000	125.0	0.0	50.0	1.28	141.2«	175.0
S21.000	100.00	9.55	14.750	0.000	10.0	0.0	4.0	1.07	42.5	14.0
S21.001	100.00	9.66	14.080	0.000	15.0	0.0	6.0	1.09	43.3	21.0
S21.002	100.00	10.30	14.030	0.000	15.0	0.0	6.0	1.07	42.7	21.0
S21.003	100.00	11.11	13.750	0.000	15.0	0.0	6.0	1.06	42.3	21.0
S22.000	100.00	9.50	14.830	0.000	15.0	0.0	6.0	1.07	42.6	21.0
S22.001	100.00	11.28	14.180	0.000	25.0	0.0	10.0	1.07	42.6	35.0
S21.004	100.00	12.22	13.335	0.000	50.0	0.0	20.0	1.29	91.1	70.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
S23.000	101.423	2.480	40.9	0.000	8.00	0.0	0.600	o	225	
S23.001	154.404	0.430	359.1	0.000	0.00	0.0	0.600	o	375	
S23.002	4.870	0.020	243.5	0.000	0.00	0.0	0.600	o	375	
S21.005	134.423	0.520	258.5	0.000	0.00	0.0	0.600	o	375	
S18.013	63.087	0.250	252.3	0.000	0.00	0.0	0.600	o	375	
S18.014	5.657	0.340	16.6	0.000	0.00	0.0	0.600	o	375	
S1.018	17.396	0.019	915.6	0.000	0.00	0.0	0.600	o	1000	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S23.000	100.00	8.82	15.850	0.000	0.0	0.0	0.0	2.05	81.6	0.0
S23.001	100.00	11.53	13.220	0.000	0.0	0.0	0.0	0.95	105.0	0.0
S23.002	100.00	11.60	12.790	0.000	0.0	0.0	0.0	1.16	127.8	0.0
S21.005	100.00	14.21	12.770	0.000	50.0	0.0	20.0	1.12	123.9	70.0
S18.013	77.63	23.58	12.250	0.000	175.0	0.0	70.0	1.14	125.5«	245.0
S18.014	77.58	23.60	12.000	0.000	175.0	0.0	70.0	4.46	492.7	245.0
S1.018	77.02	23.87	11.620	23.852	175.0	0.0	2082.1	1.10	861.5«	7287.2

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	120
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	2

Number of Input Hydrographs	0	Number of Storage Structures	3
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D2 (1km)	0.258	Winter Storms	Yes
Return Period (years)	100	D3 (1km)	0.297	Cv (Summer)	0.750
Site Location		E (1km)	0.318	Cv (Winter)	0.840
C (1km)	-0.026	F (1km)	2.445	Storm Duration (mins)	60
D1 (1km)	0.314	Summer Storms	No		

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	19.507	1.582	0.000	0.81		219.9	SURCHARGED
S1.001	S2	19.448	1.648	0.000	1.18		430.0	SURCHARGED
S2.000	S3	19.396	0.326	0.000	0.29		245.8	SURCHARGED
S2.001	S4	19.329	1.259	0.000	0.59		425.0	SURCHARGED
S2.002	S5	19.261	1.406	0.000	0.66		462.7	SURCHARGED
S1.002	S6	19.116	1.581	0.000	1.41		969.1	SURCHARGED
S1.003	S7	18.755	1.405	0.000	1.18		964.5	SURCHARGED
S1.004	S8	18.439	1.319	0.000	1.50		959.5	SURCHARGED
S1.005	S9	18.148	1.096	0.000	1.54		956.5	SURCHARGED
S3.000	S10	18.180	0.910	0.000	0.86		69.8	SURCHARGED
S3.001	S11	18.070	0.970	0.000	1.61		111.3	SURCHARGED
S1.006	S12	17.858	0.868	0.000	1.25		1050.6	SURCHARGED
S1.007	S13	17.412	0.712	0.000	1.72		1050.7	SURCHARGED
S1.008	S14	17.067	0.437	0.000	1.24		1042.1	SURCHARGED
S1.009	S15	16.286	0.156	0.000	1.83		1043.6	FLOOD RISK
S1.010	S16	15.722	-0.493	0.000	0.51		1038.9	OK
S4.000	S17	19.635	0.360	0.000	0.84		303.7	SURCHARGED
S5.000	S18	19.200	0.200	0.000	0.52		282.3	SURCHARGED
S4.001	S19	19.054	0.574	0.000	1.51		602.3	SURCHARGED
S4.002	S20	18.606	0.324	0.000	1.90		690.2	SURCHARGED
S4.003	S21	17.869	-0.281	0.000	0.55		691.2	OK
S6.000	S22	18.940	-0.079	0.000	0.89		67.7	OK
S7.000	S23	19.364	-0.111	0.000	0.83		108.2	OK
S7.001	S24	19.102	-0.115	0.000	0.82		108.5	OK
S7.002	S25	18.782	-0.111	0.000	0.84		107.8	OK
S7.003	S26	18.562	-0.114	0.000	0.83		107.9	OK
S6.001	S27	18.200	-0.319	0.000	0.45		173.0	OK
S6.002	S28	17.885	-0.334	0.000	0.41		172.0	OK
S6.003	S29	17.719	-0.321	0.000	0.54		509.5	OK
S6.004	S30	17.367	0.107	0.000	1.92		510.7	SURCHARGED
S6.005	S31	17.150	-0.160	0.000	0.97		510.3	OK
S8.000	S32	17.661	-0.259	0.000	0.20		43.4	OK
S8.001	S33	17.632	0.012	0.000	1.03		172.2	SURCHARGED
S8.002	S34	17.198	-0.122	0.000	0.88		172.7	OK
S6.006	S35	16.955	-0.245	0.000	0.44		664.7	OK
S4.004	S36	16.757	0.747	0.000	1.24		1398.6	SURCHARGED
S4.005	S37	16.302	0.002	0.000	1.06		1408.6	FLOOD RISK
S9.000	S38	17.503	-0.062	0.000	0.18		20.3	OK
S9.001	S39	17.484	0.157	0.000	0.42		31.7	SURCHARGED
S9.002	S40	17.478	0.173	0.000	1.41		229.2	SURCHARGED
S9.003	S41	17.046	-0.074	0.000	0.49		308.9	OK
S10.000	S42	18.029	0.767	0.000	1.70		297.9	SURCHARGED
S10.001	S43	17.255	0.280	0.000	1.82		295.1	SURCHARGED
S9.004	S44	16.999	0.109	0.000	1.13		648.7	SURCHARGED
S9.005	S45	16.861	0.101	0.000	0.72		615.7	SURCHARGED

Summary of Results for 60 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S9.006	S46	16.633	0.368	0.000	1.07		599.4	SURCHARGED
S9.007	S47	16.338	0.293	0.000	1.19		668.2	FLOOD RISK
S11.000	S48	16.330	-0.345	0.000	0.17		77.3	OK
S9.008	S49	16.296	0.281	0.000	1.33		724.2	FLOOD RISK
S9.009	S50	16.243	0.258	0.000	0.97		719.5	FLOOD RISK
S9.010	S51	16.100	0.265	0.000	1.03		793.7	FLOOD RISK
S9.011	S52	15.893	0.248	0.000	1.61		794.9	SURCHARGED
S9.012	S53	15.772	-0.328	0.000	0.78		793.1	OK
S12.000	S54	15.800	-0.150	0.000	0.76		532.2	OK
S12.001	S55	15.614	-0.486	0.000	0.52		530.9	OK
S13.000	S56	17.138	-0.322	0.000	0.18		48.7	OK
S13.001	S57	16.898	-0.332	0.000	0.15		48.2	OK
S13.002	S58	16.551	0.066	0.000	0.98		341.1	SURCHARGED
S13.003	S59	15.996	0.081	0.000	1.43		338.9	SURCHARGED
S13.004	S60	15.683	-0.617	0.000	0.31		339.5	OK
S14.000	S61	15.895	0.000	0.000	1.40		190.9	OK
S14.001	S62	15.786	-0.544	0.000	0.43		551.0	OK
S1.011	S63	15.201	0.901	0.000	0.05		53.0	SURCHARGED
S15.000	S64	14.487	0.513	0.000	1.23		291.1	SURCHARGED
S16.000	S65	14.008	-0.123	0.000	0.58		63.4	OK
S15.001	S66	13.816	0.291	0.000	1.41		350.7	SURCHARGED
S1.012	S67	13.729	-0.211	0.000	0.50		505.2	OK
S1.013	S68	13.721	0.471	0.000	0.18		54.6	SURCHARGED
S1.014	S69	12.651	-0.296	0.000	0.26		54.6	OK
S17.000	S70	13.763	0.238	0.000	1.06		334.0	SURCHARGED
S17.001	S71	13.204	0.179	0.000	1.00		344.7	SURCHARGED
S17.002	S72	12.757	0.182	0.000	1.22		515.0	SURCHARGED
S17.003	S73	12.456	-0.394	0.000	0.68		514.7	OK
S17.004	S74	12.190	0.090	0.000	0.02		0.8	SURCHARGED
S1.015	S75	12.180	-0.252	0.000	0.15		55.4	OK
S1.016	S76	12.170	-0.120	0.000	0.20		55.3	OK
S1.017	S77	12.164	-0.486	0.000	0.07		55.3	OK
S18.000	S78	18.252	-0.113	0.000	0.50		20.0	OK
S18.001	S79	17.826	0.197	0.000	0.87		35.0	SURCHARGED
S18.002	S80	17.309	0.379	0.000	0.60		45.0	SURCHARGED
S18.003	S81	17.257	0.477	0.000	0.56		45.0	SURCHARGED
S18.004	S82	17.144	0.734	0.000	0.63		50.0	SURCHARGED
S18.005	S83	17.014	0.944	0.000	0.69		54.9	SURCHARGED
S18.006	S84	16.875	1.105	0.000	0.72		53.9	SURCHARGED
S19.000	S85	17.603	-0.070	0.000	0.56		10.0	OK
S19.001	S86	17.253	0.036	0.000	0.57		10.0	SURCHARGED
S19.002	S87	17.156	0.251	0.000	0.63		10.0	SURCHARGED
S19.003	S88	17.125	0.300	0.000	0.51		25.0	SURCHARGED
S19.004	S89	17.037	0.562	0.000	0.52		25.0	SURCHARGED
S19.005	S90	16.827	1.152	0.000	0.84		25.0	SURCHARGED
S18.007	S91	16.803	1.173	0.000	0.95		78.4	SURCHARGED
S20.000	S92	17.273	-0.172	0.000	0.13		5.0	OK
S20.001	S93	16.746	-0.169	0.000	0.14		5.0	OK
S20.002	S94	16.346	-0.199	0.000	0.03		5.0	OK

Summary of Results for 60 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S18.008	S95	16.127	1.237	0.000	1.20		98.3	SURCHARGED
S18.009	S96	15.244	0.964	0.000	1.30		103.3	SURCHARGED
S18.010	S97	14.771	0.771	0.000	1.39		108.2	SURCHARGED
S18.011	S98	14.346	0.566	0.000	1.59		113.2	SURCHARGED
S18.012	S99	13.578	0.103	0.000	0.89		122.9	SURCHARGED
S21.000	S100	14.824	-0.151	0.000	0.24		10.0	OK
S21.001	S101	14.189	-0.116	0.000	0.48		15.0	OK
S21.002	S102	14.124	-0.131	0.000	0.37		15.0	OK
S21.003	S103	13.844	-0.131	0.000	0.37		15.0	OK
S22.000	S104	14.923	-0.132	0.000	0.36		15.0	OK
S22.001	S105	14.306	-0.099	0.000	0.60		25.0	OK
S21.004	S106	13.498	-0.137	0.000	0.57		50.0	OK
S23.000	S107	15.850	-0.225	0.000	0.00		0.0	OK
S23.001	S108	13.220	-0.375	0.000	0.00		0.0	OK
S23.002	S109	12.990	-0.175	0.000	0.00		0.0	OK
S21.005	S110	12.990	-0.155	0.000	0.42		50.0	OK
S18.013	S111	12.901	0.276	0.000	1.46		172.5	SURCHARGED
S18.014	S112	12.355	-0.020	0.000	0.76		172.4	OK
S1.018	S113	12.161	-0.459	0.000	0.66		227.5	OK

Cascade Summary of Results for Proposed Canel Works Storage Calculation (wth 10% betterment of greenfield runoff rates) 1in100 year + 40%cc.srcx

Upstream Structures

Existing Lake Storage Calculation (with flow control lowered to 14.300 aod and 10% betterment of greenfiel

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	13.618	0.218	53.4	331.5	O K
30 min Summer	13.612	0.212	53.4	322.5	O K
60 min Summer	13.619	0.219	53.4	333.3	O K
120 min Summer	13.608	0.208	53.4	315.7	O K
180 min Summer	13.617	0.217	53.4	329.6	O K
240 min Summer	13.623	0.223	53.4	339.8	O K
360 min Summer	13.631	0.231	53.4	354.0	O K
480 min Summer	13.637	0.237	53.4	363.0	O K
600 min Summer	13.640	0.240	53.4	369.0	O K
720 min Summer	13.643	0.243	53.4	372.9	O K
960 min Summer	13.638	0.238	53.4	364.4	O K
1440 min Summer	13.628	0.228	53.4	349.0	O K
2160 min Summer	13.618	0.218	53.4	331.3	O K
2880 min Summer	13.609	0.209	53.4	317.6	O K
4320 min Summer	13.610	0.210	53.4	318.0	O K
5760 min Summer	13.613	0.213	53.4	322.7	O K
7200 min Summer	13.616	0.216	53.4	328.5	O K
8640 min Summer	13.620	0.220	53.4	335.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	212.964	0.0	4443.1	1440
30 min Summer	121.842	0.0	4426.3	1440
60 min Summer	69.708	0.0	8860.9	2308
120 min Summer	39.882	0.0	8851.1	124
180 min Summer	28.768	0.0	8811.7	184
240 min Summer	22.817	0.0	8686.8	244
360 min Summer	16.459	0.0	8523.6	362
480 min Summer	13.054	0.0	8420.0	482
600 min Summer	10.906	0.0	8345.3	602
720 min Summer	9.417	0.0	8288.2	722
960 min Summer	7.349	0.0	8178.1	960
1440 min Summer	5.182	0.0	8002.4	1028
2160 min Summer	3.654	0.0	16252.6	1388
2880 min Summer	2.852	0.0	15656.5	1732
4320 min Summer	2.043	0.0	14443.4	2440
5760 min Summer	1.613	0.0	24183.1	3248
7200 min Summer	1.342	0.0	25063.7	4080
8640 min Summer	1.155	0.0	25752.4	4928

Cascade Summary of Results for Proposed Canel Works Storage Calculation (wth 10% betterment of greenfield runoff rates) 1in100 year + 40%cc.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
10080 min Summer	13.642	0.242	53.4	372.3	O K
15 min Winter	13.616	0.216	53.4	328.3	O K
30 min Winter	13.599	0.199	53.4	301.4	O K
60 min Winter	13.616	0.216	53.4	328.7	O K
120 min Winter	13.636	0.236	53.4	361.3	O K
180 min Winter	13.649	0.249	53.4	383.4	O K
240 min Winter	13.658	0.258	53.5	399.6	O K
360 min Winter	13.672	0.272	53.9	422.7	O K
480 min Winter	13.681	0.281	54.2	438.7	O K
600 min Winter	13.688	0.288	54.4	450.7	O K
720 min Winter	13.693	0.293	54.5	459.9	O K
960 min Winter	13.693	0.293	54.5	459.6	O K
1440 min Winter	13.686	0.286	54.3	447.8	O K
2160 min Winter	13.667	0.267	53.8	414.1	O K
2880 min Winter	13.645	0.245	53.4	376.5	O K
4320 min Winter	13.622	0.222	53.4	338.2	O K
5760 min Winter	13.628	0.228	53.4	347.7	O K
7200 min Winter	13.634	0.234	53.4	357.7	O K
8640 min Winter	13.640	0.240	53.4	368.1	O K
10080 min Winter	13.646	0.246	53.4	378.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	1.018	0.0	26192.7	10080
15 min Winter	212.964	0.0	4443.3	1440
30 min Winter	121.842	0.0	4406.4	37
60 min Winter	69.708	0.0	8754.4	66
120 min Winter	39.882	0.0	8806.9	124
180 min Winter	28.768	0.0	8676.8	182
240 min Winter	22.817	0.0	8604.1	240
360 min Winter	16.459	0.0	8536.2	358
480 min Winter	13.054	0.0	8517.0	474
600 min Winter	10.906	0.0	8529.3	592
720 min Winter	9.417	0.0	8564.7	710
960 min Winter	7.349	0.0	8505.7	942
1440 min Winter	5.182	0.0	8271.9	1400
2160 min Winter	3.654	0.0	16492.6	2056
2880 min Winter	2.852	0.0	16000.4	2192
4320 min Winter	2.043	0.0	15098.7	2412
5760 min Winter	1.613	0.0	27014.9	3224
7200 min Winter	1.342	0.0	27903.7	4064
8640 min Winter	1.155	0.0	28414.5	4936
10080 min Winter	1.018	0.0	28520.0	5848

Cascade Rainfall Details for Proposed Canel Works Storage Calculation (wth 10% betterment of greenfield runoff rates) 1in100 year + 40%cc.srcx

Rainfall Model	FEH	D3 (1km)	0.297	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.318	Shortest Storm (mins)	15
Site Location		F (1km)	2.445	Longest Storm (mins)	10080
C (1km)	-0.026	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.314	Winter Storms	Yes		
D2 (1km)	0.258	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 0.658

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.329	4	8	0.329

Cascade Model Details for Proposed Canel Works Storage Calculation (wth 10% betterment of greenfield runoff rates) 1in100 year + 40%cc.srcx

Storage is Online Cover Level (m) 14.100

Tank or Pond Structure

Invert Level (m) 13.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1406.0	0.200	1624.0	0.400	1949.0	0.600	2307.0
0.100	1508.0	0.300	1774.0	0.500	2128.0	0.700	1934.0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0307-5480-0900-5480
Design Head (m)	0.900
Design Flow (l/s)	54.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	307
Invert Level (m)	12.800
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.900	54.7
Flush-Flo™	0.448	54.8
Kick-Flo®	0.735	49.6
Mean Flow over Head Range	-	42.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.3	1.200	62.9	3.000	98.1	7.000	148.4
0.200	31.5	1.400	67.8	3.500	105.8	7.500	153.5
0.300	52.9	1.600	72.3	4.000	112.9	8.000	158.4
0.400	54.6	1.800	76.5	4.500	119.6	8.500	163.2
0.500	54.6	2.000	80.6	5.000	125.9	9.000	167.8
0.600	53.4	2.200	84.4	5.500	131.9	9.500	171.1
0.800	51.7	2.400	88.0	6.000	137.6		
1.000	57.6	2.600	91.5	6.500	143.1		

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	12.175	0.375	5.3	832.8	O K
30 min Summer	12.224	0.424	5.3	950.0	O K
60 min Summer	12.278	0.478	5.3	1080.8	O K
120 min Summer	12.336	0.536	5.3	1223.6	O K
180 min Summer	12.371	0.571	5.3	1310.5	O K
240 min Summer	12.396	0.596	5.3	1372.5	O K
360 min Summer	12.430	0.630	5.3	1457.4	O K
480 min Summer	12.452	0.652	5.3	1513.6	O K
600 min Summer	12.468	0.668	5.3	1553.1	O K
720 min Summer	12.479	0.679	5.3	1581.6	O K
960 min Summer	12.482	0.682	5.3	1588.4	O K
1440 min Summer	12.473	0.673	5.3	1566.7	O K
2160 min Summer	12.445	0.645	5.3	1494.7	O K
2880 min Summer	12.413	0.613	5.3	1416.2	O K
4320 min Summer	12.373	0.573	5.3	1316.2	O K
5760 min Summer	12.338	0.538	5.3	1227.9	O K
7200 min Summer	12.304	0.504	5.3	1144.1	O K
8640 min Summer	12.268	0.468	5.3	1056.0	O K
10080 min Summer	12.233	0.433	5.3	972.4	O K
15 min Winter	12.217	0.417	5.3	933.5	O K
30 min Winter	12.271	0.471	5.3	1065.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	212.964	0.0	451.9	23
30 min Summer	121.842	0.0	443.2	38
60 min Summer	69.708	0.0	884.2	68
120 min Summer	39.882	0.0	857.4	128
180 min Summer	28.768	0.0	843.0	188
240 min Summer	22.817	0.0	834.4	246
360 min Summer	16.459	0.0	824.7	366
480 min Summer	13.054	0.0	819.8	486
600 min Summer	10.906	0.0	817.3	606
720 min Summer	9.417	0.0	816.3	724
960 min Summer	7.349	0.0	813.5	964
1440 min Summer	5.182	0.0	809.0	1442
2160 min Summer	3.654	0.0	1644.9	2160
2880 min Summer	2.852	0.0	1596.1	2480
4320 min Summer	2.043	0.0	1486.1	3240
5760 min Summer	1.613	0.0	2437.4	4032
7200 min Summer	1.342	0.0	2535.6	4896
8640 min Summer	1.155	0.0	2619.2	5624
10080 min Summer	1.018	0.0	2691.7	6448
15 min Winter	212.964	0.0	445.5	23
30 min Winter	121.842	0.0	430.5	38

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	12.332	0.532	5.3	1212.6	O K
120 min Winter	12.397	0.597	5.3	1374.1	O K
180 min Winter	12.436	0.636	5.3	1473.2	O K
240 min Winter	12.464	0.664	5.3	1544.3	O K
360 min Winter	12.503	0.703	5.3	1642.9	O K
480 min Winter	12.529	0.729	5.3	1709.4	O K
600 min Winter	12.547	0.747	5.4	1757.3	O K
720 min Winter	12.561	0.761	5.4	1792.9	O K
960 min Winter	12.567	0.767	5.4	1807.4	O K
1440 min Winter	12.563	0.763	5.4	1796.9	O K
2160 min Winter	12.539	0.739	5.3	1736.1	O K
2880 min Winter	12.507	0.707	5.3	1653.6	O K
4320 min Winter	12.457	0.657	5.3	1525.9	O K
5760 min Winter	12.412	0.612	5.3	1411.7	O K
7200 min Winter	12.366	0.566	5.3	1298.2	O K
8640 min Winter	12.320	0.520	5.3	1184.0	O K
10080 min Winter	12.269	0.469	5.3	1058.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	69.708	0.0	862.7	68
120 min Winter	39.882	0.0	840.4	126
180 min Winter	28.768	0.0	831.8	184
240 min Winter	22.817	0.0	828.2	244
360 min Winter	16.459	0.0	827.6	362
480 min Winter	13.054	0.0	831.5	480
600 min Winter	10.906	0.0	838.6	596
720 min Winter	9.417	0.0	846.3	714
960 min Winter	7.349	0.0	849.7	946
1440 min Winter	5.182	0.0	844.7	1404
2160 min Winter	3.654	0.0	1660.1	2076
2880 min Winter	2.852	0.0	1620.9	2712
4320 min Winter	2.043	0.0	1542.8	3412
5760 min Winter	1.613	0.0	2730.0	4328
7200 min Winter	1.342	0.0	2840.1	5264
8640 min Winter	1.155	0.0	2907.8	6216
10080 min Winter	1.018	0.0	2890.3	7056

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.318	Shortest Storm (mins)	15
Site Location		F (1km)	2.445	Longest Storm (mins)	10080
C (1km)	-0.026	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.314	Winter Storms	Yes		
D2 (1km)	0.258	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 2.100

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	1.050	4	8	1.050

Model Details

Storage is Online Cover Level (m) 13.100

Tank or Pond Structure

Invert Level (m) 11.800

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1772.0	0.400	2393.0	0.800	2613.0	1.200	2877.0
0.100	2229.0	0.500	2448.0	0.900	2667.0		
0.200	2283.0	0.600	2503.0	1.000	2721.0		
0.300	2338.0	0.700	2559.0	1.100	2792.0		

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0112-5400-0800-5400
Design Head (m)	0.800
Design Flow (l/s)	5.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	112
Invert Level (m)	11.750
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	5.4
Flush-Flo™	0.239	5.3
Kick-Flo®	0.534	4.5
Mean Flow over Head Range	-	4.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.9	1.200	6.5	3.000	10.0	7.000	15.0
0.200	5.3	1.400	7.0	3.500	10.7	7.500	15.5
0.300	5.3	1.600	7.4	4.000	11.5	8.000	15.9
0.400	5.1	1.800	7.8	4.500	12.1	8.500	16.4
0.500	4.8	2.000	8.2	5.000	12.7	9.000	16.9
0.600	4.7	2.200	8.6	5.500	13.3	9.500	17.3
0.800	5.4	2.400	9.0	6.000	13.9		
1.000	6.0	2.600	9.3	6.500	14.4		

FOUL SEWERAGE DESIGN

Network Design Table for 31500 EXISTING FOUL.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.000	88.938	0.650	136.8	0.000	0	5.9	1.500	o	150	
F1.001	9.627	0.150	64.2	0.000	0	0.6	1.500	o	150	
F2.000	25.850	0.410	63.0	0.000	0	0.0	1.500	o	150	
F1.002	60.043	1.455	41.3	0.000	0	0.0	1.500	o	150	
F1.003	50.467	0.315	160.2	0.000	0	2.6	1.500	o	225	
F3.000	68.686	0.665	103.3	0.000	0	5.2	1.500	o	150	
F4.000	68.643	1.440	47.7	0.000	0	0.5	1.500	o	150	
F4.001	19.809	0.260	76.2	0.000	0	0.0	1.500	o	150	
F4.002	15.236	0.445	34.2	0.000	0	0.0	1.500	o	150	
F3.001	51.986	0.365	142.4	0.000	0	0.0	1.500	o	225	
F1.004	12.257	0.050	245.1	0.000	0	0.0	1.500	o	300	
F1.005	14.161	0.060	236.0	0.000	0	0.0	1.500	o	300	
F1.006	68.140	0.300	227.1	0.000	0	0.0	1.500	o	300	
F1.007	20.647	0.090	229.4	0.000	0	0.0	1.500	o	300	
F1.008	113.782	0.460	247.4	0.000	0	5.5	1.500	o	300	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	18.150	0.000	5.9	0	0.6	74	0.74	0.75	13.2	6.5
F1.001	17.500	0.000	6.5	0	0.7	63	1.01	1.09	19.3	7.2
F2.000	17.760	0.000	0.0	0	0.0	0	0.00	1.10	19.5	0.0
F1.002	17.350	0.000	6.5	0	0.7	56	1.19	1.37	24.1	7.2
F1.003	15.820	0.000	9.1	0	0.9	81	0.78	0.91	36.0	10.0
F3.000	16.610	0.000	5.2	0	0.5	64	0.80	0.86	15.2	5.7
F4.000	18.090	0.000	0.5	0	0.1	16	0.52	1.27	22.5	0.6
F4.001	16.650	0.000	0.5	0	0.1	18	0.44	1.00	17.7	0.6
F4.002	16.390	0.000	0.5	0	0.1	15	0.58	1.50	26.5	0.6
F3.001	15.870	0.000	5.7	0	0.6	62	0.71	0.96	38.2	6.3
F1.004	15.430	0.000	14.8	0	1.5	104	0.74	0.88	62.5	16.3
F1.005	15.380	0.000	14.8	0	1.5	103	0.75	0.90	63.7	16.3
F1.006	15.320	0.000	14.8	0	1.5	102	0.77	0.92	64.9	16.3
F1.007	15.020	0.000	14.8	0	1.5	103	0.76	0.91	64.6	16.3
F1.008	14.930	0.000	20.3	0	2.0	124	0.81	0.88	62.2	22.3

FOUL SEWERAGE DESIGN

Network Design Table for 31500 EXISTING FOUL.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.009	49.545	0.300	165.2	0.000	0	0.0	1.500	o	300	
F1.010	104.204	0.300	347.3	0.000	0	2.3	1.500	o	300	
F5.000	83.152	0.460	180.8	0.000	0	0.0	1.500	o	225	
F5.001	75.888	0.420	180.7	0.000	0	0.0	1.500	o	225	
F6.000	208.601	1.555	134.1	0.000	0	8.0	1.500	o	150	
F5.002	32.288	0.370	87.3	0.000	0	5.4	1.500	o	225	
F5.003	49.316	0.080	616.5	0.000	0	0.0	1.500	o	225	
F7.000	56.798	0.575	98.8	0.000	0	3.0	1.500	o	150	
F5.004	118.324	0.800	147.9	0.000	0	1.5	1.500	o	225	
F8.000	25.252	0.305	82.8	0.000	0	0.4	1.500	o	150	
F9.000	47.119	0.415	113.5	0.000	0	6.8	1.500	o	150	
F9.001	23.959	0.240	99.8	0.000	0	0.0	1.500	o	225	
F9.002	36.771	0.370	99.4	0.000	0	0.7	1.500	o	225	
F9.003	62.338	0.730	85.4	0.000	0	0.0	1.500	o	225	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.009	14.470	0.000	20.3	0	2.0	111	0.94	1.08	76.2	22.3
F1.010	14.170	0.000	22.6	0	2.3	145	0.73	0.74	52.4	24.9
F5.000	18.050	0.000	0.0	0	0.0	0	0.00	0.85	33.9	0.0
F5.001	17.590	0.000	0.0	0	0.0	0	0.00	0.85	33.9	0.0
F6.000	18.800	0.000	8.0	0	0.8	89	0.81	0.76	13.4	8.8
F5.002	17.170	0.000	13.4	0	1.3	85	1.08	1.23	48.9	14.7
F5.003	16.800	0.000	13.4	0	1.3	153	0.51	0.46	18.3	14.7
F7.000	17.370	0.000	3.0	0	0.3	47	0.70	0.88	15.6	3.3
F5.004	16.720	0.000	17.9	0	1.8	116	0.95	0.94	37.5	19.7
F8.000	16.300	0.000	0.4	0	0.0	17	0.40	0.96	17.0	0.4
F9.000	17.750	0.000	6.8	0	0.7	76	0.83	0.82	14.5	7.5
F9.001	17.260	0.000	6.8	0	0.7	62	0.85	1.15	45.7	7.5
F9.002	17.020	0.000	7.5	0	0.8	65	0.87	1.15	45.8	8.3
F9.003	16.650	0.000	7.5	0	0.8	62	0.92	1.24	49.4	8.3

FOUL SEWERAGE DESIGN

Network Design Table for 31500 EXISTING FOUL.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F5.005	113.630	1.975	57.5	0.000	0	1.7	1.500	o	225	
F10.000	49.090	0.690	71.1	0.000	0	1.3	1.500	o	150	
F1.011	8.463	0.085	100.0	0.000	0	0.8	1.500	o	300	
F1.012	83.707	0.541	154.7	0.000	0	2.4	1.500	o	300	
F11.000	52.827	0.681	77.6	0.000	0	1.0	1.500	o	150	
F1.013	127.302	0.468	272.0	0.000	0	0.5	1.500	o	375	
F12.000	118.313	1.105	107.1	0.000	0	2.2	1.500	o	150	
F13.000	31.072	0.330	94.2	0.000	0	0.0	1.500	o	150	
F14.000	195.191	1.526	127.9	0.000	0	12.7	1.500	o	225	
F14.001	25.073	0.160	156.7	0.000	0	2.4	1.500	o	225	
F14.002	66.673	0.444	150.2	0.000	0	0.0	1.500	o	225	
F14.003	114.512	0.763	150.1	0.000	0	9.2	1.500	o	225	
F14.004	57.446	0.383	150.0	0.000	0	0.0	1.500	o	225	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F5.005	15.920	0.000	27.5	0	2.8	113	1.52	1.52	60.2	30.3
F10.000	14.710	0.000	1.3	0	0.1	29	0.61	1.04	18.4	1.4
F1.011	13.870	0.000	52.2	0	5.2	165	1.44	1.39	98.0	57.4
F1.012	13.785	0.000	54.6	0	5.5	197	1.22	1.11	78.7	60.1
F11.000	14.000	0.000	1.0	0	0.1	26	0.55	1.00	17.6	1.1
F1.013	13.169	0.000	56.1	0	5.6	204	1.00	0.97	107.2	61.7
F12.000	15.180	0.000	2.2	0	0.2	41	0.62	0.85	15.0	2.4
F13.000	14.330	0.000	0.0	0	0.0	0	0.00	0.90	16.0	0.0
F14.000	18.800	0.000	12.7	0	1.3	91	0.92	1.01	40.3	14.0
F14.001	17.274	0.000	15.1	0	1.5	107	0.90	0.92	36.4	16.6
F14.002	17.114	0.000	15.1	0	1.5	105	0.91	0.94	37.2	16.6
F14.003	16.670	0.000	24.3	0	2.4	141	1.02	0.94	37.2	26.7
F14.004	15.907	0.000	24.3	0	2.4	141	1.02	0.94	37.2	26.7

FOUL SEWERAGE DESIGN

Network Design Table for 31500 EXISTING FOUL.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F14.005	89.407	0.894	100.0	0.000	0	1.7	1.500	o	225	
F14.006	7.900	0.630	12.5	0.000	0	0.0	1.500	o	225	
F12.001	116.072	1.100	105.5	0.000	0	1.3	1.500	o	225	
F1.014	64.644	0.273	236.8	0.000	0	1.7	1.500	o	375	
F1.015	36.600	0.183	200.0	0.000	0	0.0	1.500	o	375	
F1.016	70.438	0.352	200.1	0.000	0	0.0	1.500	o	375	
F1.017	68.295	1.541	44.3	0.000	0	0.0	1.500	o	375	
F15.000	63.654	0.640	99.5	0.000	0	5.9	1.500	o	150	
F15.001	82.127	0.821	100.0	0.000	0	6.3	1.500	o	150	
F15.002	103.522	1.035	100.0	0.000	0	1.4	1.500	o	150	
F15.003	26.243	0.325	80.7	0.000	0	0.0	1.500	o	150	
F16.000	99.183	0.761	130.3	0.000	0	6.1	1.500	o	150	
F16.001	23.026	0.304	75.7	0.000	0	0.0	1.500	o	150	
F15.004	58.118	0.250	232.5	0.000	0	2.2	1.500	o	225	
F15.005	11.025	0.061	180.7	0.000	0	0.0	1.500	o	225	
F15.006	22.268	0.148	150.5	0.000	0	0.0	1.500	o	225	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F14.005	15.524	0.000	26.0	0	2.6	129	1.21	1.15	45.6	28.6
F14.006	14.630	0.000	26.0	0	2.6	72	2.61	3.25	129.3	28.6
F12.001	14.000	0.000	29.5	0	3.0	143	1.22	1.12	44.4	32.5
F1.014	12.700	0.000	87.3	0	8.7	263	1.16	1.04	114.9	96.0
F1.015	12.427	0.000	87.3	0	8.7	247	1.25	1.13	125.1	96.0
F1.016	12.244	0.000	87.3	0	8.7	247	1.25	1.13	125.0	96.0
F1.017	11.892	0.000	87.3	0	8.7	156	2.22	2.41	266.4	96.0
F15.000	14.012	0.000	5.9	0	0.6	68	0.84	0.88	15.5	6.5
F15.001	13.216	0.000	12.2	0	1.2	108	0.99	0.88	15.5	13.4
F15.002	12.395	0.000	13.6	0	1.4	119	1.00	0.88	15.5	15.0
F15.003	11.360	0.000	13.6	0	1.4	108	1.10	0.98	17.2	15.0
F16.000	12.100	0.000	6.1	0	0.6	75	0.76	0.77	13.5	6.7
F16.001	11.339	0.000	6.1	0	0.6	64	0.94	1.01	17.8	6.7
F15.004	10.960	0.000	21.9	0	2.2	153	0.83	0.75	29.9	24.1
F15.005	10.710	0.000	21.9	0	2.2	140	0.93	0.85	33.9	24.1
F15.006	10.649	0.000	21.9	0	2.2	132	0.99	0.93	37.2	24.1

FOUL SEWERAGE DESIGN

Network Design Table for 31500 EXISTING FOUL.FWS

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Auto Design
F1.018	124.346	0.829	150.0	0.000	0	0.0	1.500	o	375	
F1.019	37.257	0.248	150.2	0.000	0	0.0	1.500	o	375	
F1.020	90.600	0.604	150.0	0.000	0	0.0	1.500	o	375	
F1.021	71.273	0.475	150.0	0.000	0	0.0	1.500	o	375	
F1.022	21.642	0.144	150.3	0.000	0	0.0	1.500	o	375	
F1.023	31.371	0.209	150.1	0.000	0	0.0	1.500	o	375	
F1.024	135.028	0.900	150.0	0.000	0	0.0	1.500	o	375	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.018	10.351	0.000	109.2	0	10.9	262	1.46	1.31	144.5	120.1
F1.019	9.528	0.000	109.2	0	10.9	262	1.46	1.31	144.4	120.1
F1.020	9.280	0.000	109.2	0	10.9	262	1.46	1.31	144.5	120.1
F1.021	8.676	0.000	109.2	0	10.9	262	1.46	1.31	144.5	120.1
F1.022	8.201	0.000	109.2	0	10.9	262	1.46	1.31	144.4	120.1
F1.023	8.057	0.000	109.2	0	10.9	262	1.46	1.31	144.5	120.1
F1.024	7.848	0.000	109.2	0	10.9	262	1.46	1.31	144.5	120.1

Free Flowing Outfall Details for 31500 EXISTING FOUL.FWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F1.024	F66	10.960	6.948	0.000	0	0

Cascade Summary of Results for Existing Lake Storage Calculation (with flow control lowered to 14.300 aod and 10% betterment of greenfield runoff rates) +40%cc.srcx

Upstream Structures **Outflow To**

(None) Proposed Canel Works Storage Calculation (wth 10% betterment of greenfield runoff rates) 1in100

Half Drain Time : 2894 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	15.223	0.923	0.0	53.1	53.1	8112.0	O K
30 min Summer	15.340	1.040	0.0	53.1	53.1	9262.7	O K
60 min Summer	15.469	1.169	0.0	53.1	53.1	10551.3	O K
120 min Summer	15.607	1.307	0.0	53.1	53.1	11972.9	O K
180 min Summer	15.690	1.390	0.0	53.1	53.1	12848.4	O K
240 min Summer	15.749	1.449	0.0	53.1	53.1	13476.3	O K
360 min Summer	15.830	1.530	0.0	53.1	53.1	14348.9	O K
480 min Summer	15.884	1.584	0.0	53.1	53.1	14938.4	O K
600 min Summer	15.923	1.623	0.0	53.1	53.1	15362.9	O K
720 min Summer	15.951	1.651	0.0	53.1	53.1	15678.5	O K
960 min Summer	15.964	1.664	0.0	53.1	53.1	15817.0	O K
1440 min Summer	15.956	1.656	0.0	53.1	53.1	15734.4	O K
2160 min Summer	15.907	1.607	0.0	53.1	53.1	15187.8	O K
2880 min Summer	15.847	1.547	0.0	53.1	53.1	14530.3	O K
4320 min Summer	15.768	1.468	0.0	53.1	53.1	13679.9	O K
5760 min Summer	15.692	1.392	0.0	53.1	53.1	12865.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	212.964	0.0	4512.1	31
30 min Summer	121.842	0.0	4448.3	46
60 min Summer	69.708	0.0	8747.7	76
120 min Summer	39.882	0.0	8598.6	134
180 min Summer	28.768	0.0	8386.6	194
240 min Summer	22.817	0.0	8236.8	254
360 min Summer	16.459	0.0	8037.3	372
480 min Summer	13.054	0.0	7905.0	492
600 min Summer	10.906	0.0	7807.2	610
720 min Summer	9.417	0.0	7731.5	730
960 min Summer	7.349	0.0	7598.4	968
1440 min Summer	5.182	0.0	7389.8	1444
2160 min Summer	3.654	0.0	15604.2	2160
2880 min Summer	2.852	0.0	14982.2	2484
4320 min Summer	2.043	0.0	13717.4	3240
5760 min Summer	1.613	0.0	23418.1	4040

Cascade Summary of Results for Existing Lake Storage Calculation (with flow control lowered to 14.300 aod and 10% betterment of greenfield runoff rates) +40%cc.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Summer	15.615	1.315	0.0	53.1	53.1	12052.8	O K
8640 min Summer	15.530	1.230	0.0	53.1	53.1	11178.6	O K
10080 min Summer	15.450	1.150	0.0	53.1	53.1	10359.8	O K
15 min Winter	15.323	1.023	0.0	53.1	53.1	9092.5	O K
30 min Winter	15.452	1.152	0.0	53.1	53.1	10386.3	O K
60 min Winter	15.594	1.294	0.0	53.1	53.1	11838.2	O K
120 min Winter	15.746	1.446	0.0	53.1	53.1	13437.9	O K
180 min Winter	15.837	1.537	0.0	53.1	53.1	14426.6	O K
240 min Winter	15.902	1.602	0.0	53.1	53.1	15140.4	O K
360 min Winter	15.993	1.693	0.0	53.1	53.1	16141.3	O K
480 min Winter	16.054	1.754	0.0	53.1	53.1	16826.5	O K
600 min Winter	16.098	1.798	0.0	53.1	53.1	17327.5	O K
720 min Winter	16.131	1.831	0.0	53.1	53.1	17706.9	O K
960 min Winter	16.149	1.849	0.0	53.1	53.1	17912.1	O K
1440 min Winter	16.149	1.849	0.0	53.1	53.1	17921.2	O K
2160 min Winter	16.110	1.810	0.0	53.1	53.1	17465.8	O K
2880 min Winter	16.048	1.748	0.0	53.1	53.1	16769.1	O K
4320 min Winter	15.949	1.649	0.0	53.1	53.1	15658.3	O K
5760 min Winter	15.854	1.554	0.0	53.1	53.1	14606.8	O K
7200 min Winter	15.753	1.453	0.0	53.1	53.1	13516.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Summer	1.342	0.0	24269.8	4896
8640 min Summer	1.155	0.0	24932.8	5624
10080 min Summer	1.018	0.0	25345.1	6368
15 min Winter	212.964	0.0	4477.3	31
30 min Winter	121.842	0.0	4364.9	45
60 min Winter	69.708	0.0	8685.7	74
120 min Winter	39.882	0.0	8367.2	132
180 min Winter	28.768	0.0	8200.6	192
240 min Winter	22.817	0.0	8100.8	250
360 min Winter	16.459	0.0	7990.6	366
480 min Winter	13.054	0.0	7940.8	484
600 min Winter	10.906	0.0	7927.2	602
720 min Winter	9.417	0.0	7940.5	718
960 min Winter	7.349	0.0	7926.3	952
1440 min Winter	5.182	0.0	7794.3	1412
2160 min Winter	3.654	0.0	15765.7	2080
2880 min Winter	2.852	0.0	15244.7	2716
4320 min Winter	2.043	0.0	14285.3	3412
5760 min Winter	1.613	0.0	26160.2	4328
7200 min Winter	1.342	0.0	27014.5	5264

Cascade Summary of Results for Existing Lake Storage Calculation (with flow control lowered to 14.300 aod and 10% betterment of greenfield runoff rates) +40%cc.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Winter	15.647	1.347	0.0	53.1	53.1	12388.4	O K
10080 min Winter	15.524	1.224	0.0	53.1	53.1	11112.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Winter	1.155	0.0	27495.0	6152
10080 min Winter	1.018	0.0	27576.2	7056

Cascade Rainfall Details for Existing Lake Storage Calculation (with flow control lowered to 14.300 aod and 10% betterment of greenfield runoff rates) +40%cc.srcx

Rainfall Model	FEH	D3 (1km)	0.297	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.318	Shortest Storm (mins)	15
Site Location		F (1km)	2.445	Longest Storm (mins)	10080
C (1km)	-0.026	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.314	Winter Storms	Yes		
D2 (1km)	0.258	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 20.480

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	5.120	4	8	5.120	8	12	5.120	12	16	5.120

Cascade Model Details for Existing Lake Storage Calculation (with flow control lowered to 14.300 aod and 10% betterment of greenfield runoff rates) +40%cc.srcx

Storage is Online Cover Level (m) 16.500

Infiltration Basin Structure

Invert Level (m) 14.300 Safety Factor 5.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	7926.0	0.600	9052.0	1.200	10213.0	1.800	11411.0
0.100	8112.0	0.700	9243.0	1.300	10410.0	1.900	11614.0
0.200	8299.0	0.800	9435.0	1.400	10608.0	2.000	11841.0
0.300	8485.0	0.900	9628.0	1.500	10807.0		
0.400	8673.0	1.000	9822.0	1.600	11007.0		
0.500	8862.0	1.100	10017.0	1.700	11208.0		

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0291-5310-1900-5310
Design Head (m)	1.900
Design Flow (l/s)	53.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	291
Invert Level (m)	14.300
Minimum Outlet Pipe Diameter (mm)	375
Suggested Manhole Diameter (mm)	2100

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.900	53.1
Flush-Flo™	0.587	53.1
Kick-Flo®	1.285	44.0
Mean Flow over Head Range	-	45.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	9.0	1.000	50.7	2.400	59.4	5.500	88.8
0.200	29.9	1.200	47.0	2.600	61.8	6.000	92.7
0.300	49.3	1.400	45.8	3.000	66.2	6.500	96.4
0.400	51.8	1.600	48.9	3.500	71.3	7.000	99.9
0.500	52.9	1.800	51.7	4.000	76.1	7.500	103.3
0.600	53.1	2.000	54.4	4.500	80.6	8.000	106.6
0.800	52.3	2.200	57.0	5.000	84.8	8.500	109.8

Hydro-Brake Optimum® Outflow Control

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
9.000	112.9	9.500	115.9				

Appendix M LLFA Correspondence

CAMBRIDGESHIRE COUNTY COUNCIL FLOOD ASSETS DATA REPORT

Customer

Peter Brett Associates
Telford House, Fulbourn, Cambridge, CB21 5HB

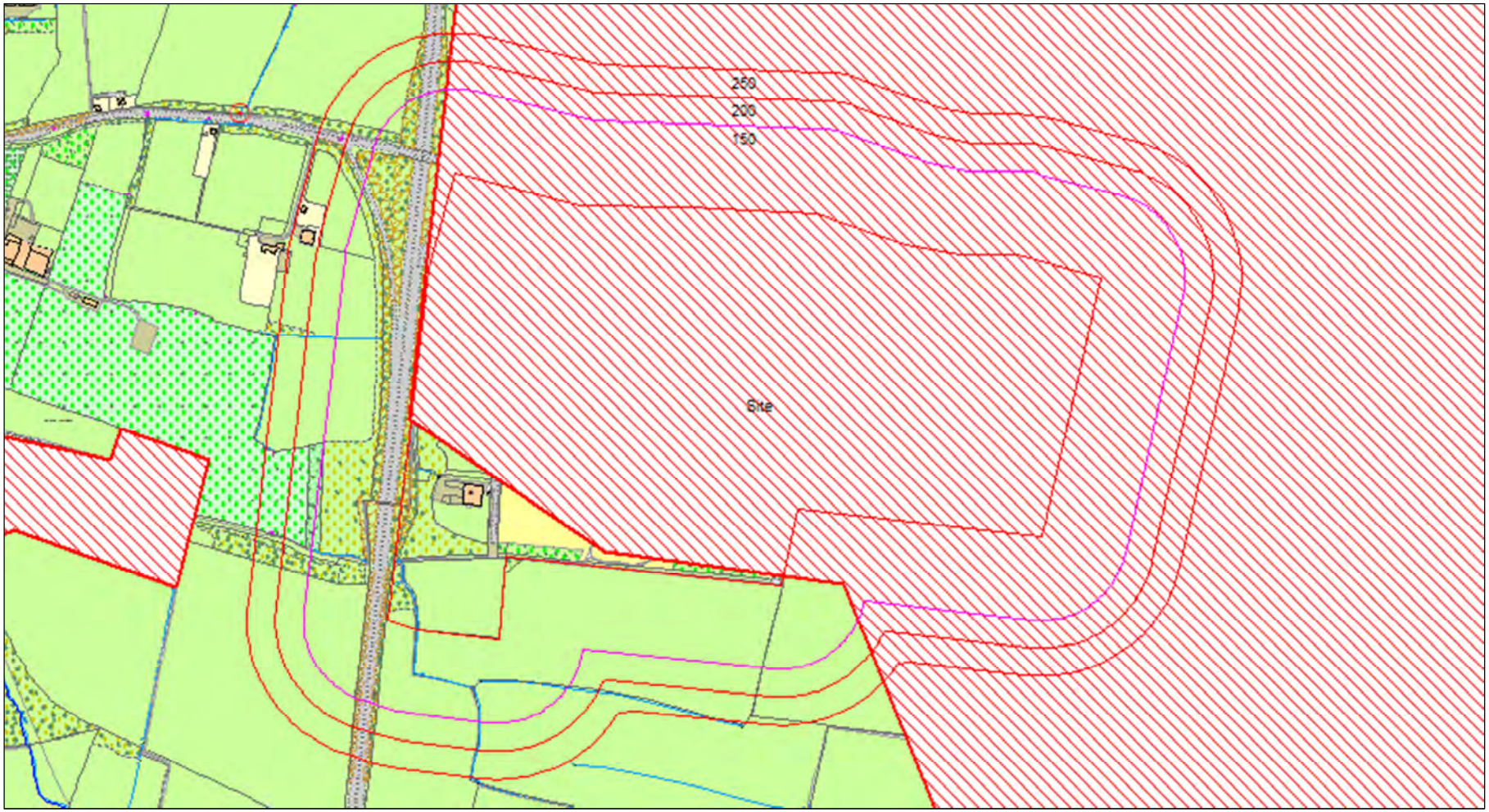
Customer Representative: Christina Vlachou-Ess

1. CAMBRIDGESHIRE FLOOD ASSETS REPORT

DATE: 13 October 2015 TIME: 11:24

Site Centre Coordinates (British National Grid): 542651, 258935
Site Area: 702924.00 sq.metres
Buffer Search Type: Polygon buffer search
Buffer Search Radius: 150 and 250 metres
Selection Summary: A total of 35 features were selected on 4 out of 27 target layers.

2. Site Map

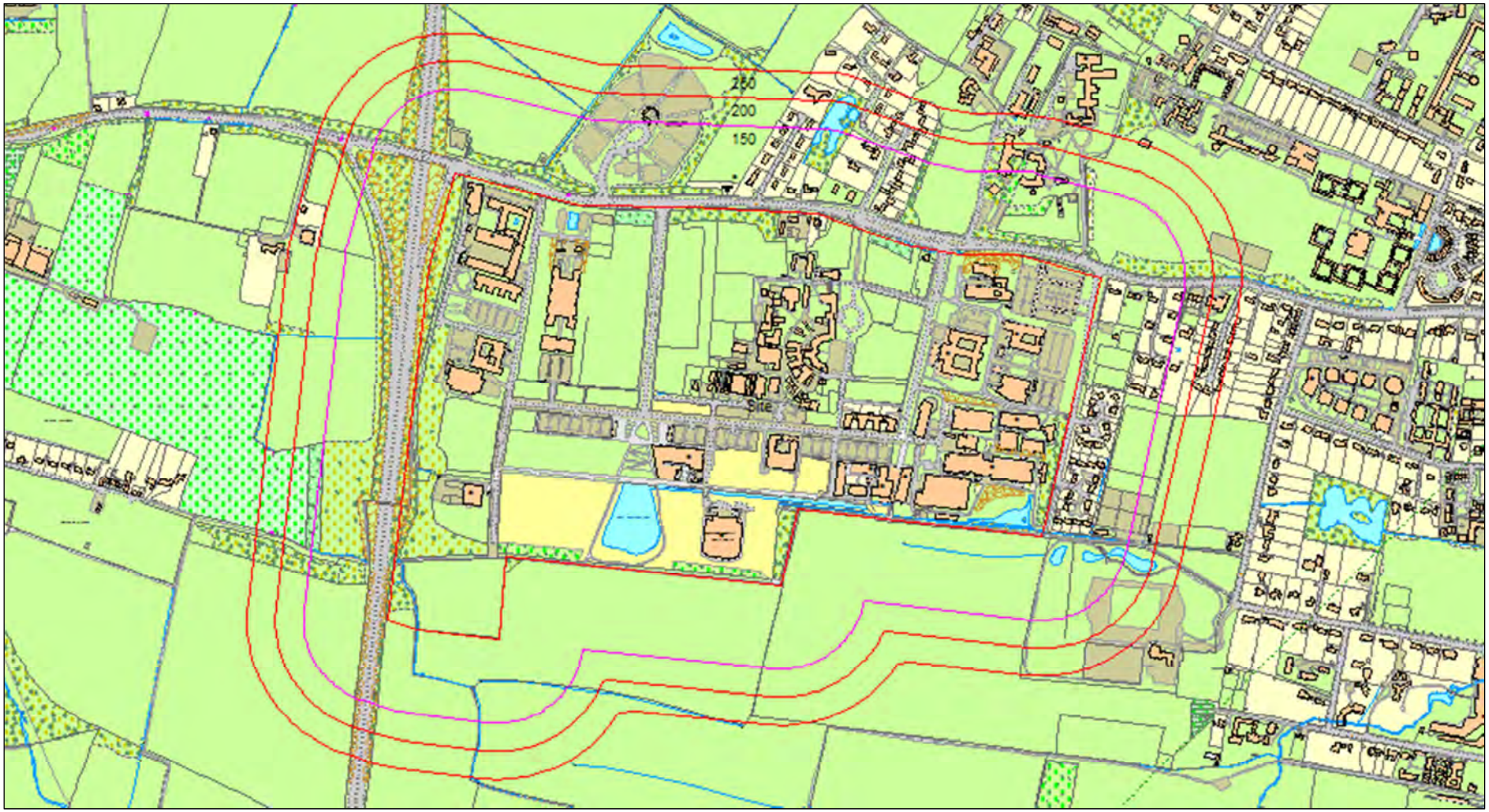


3. Summary Report Datasheet

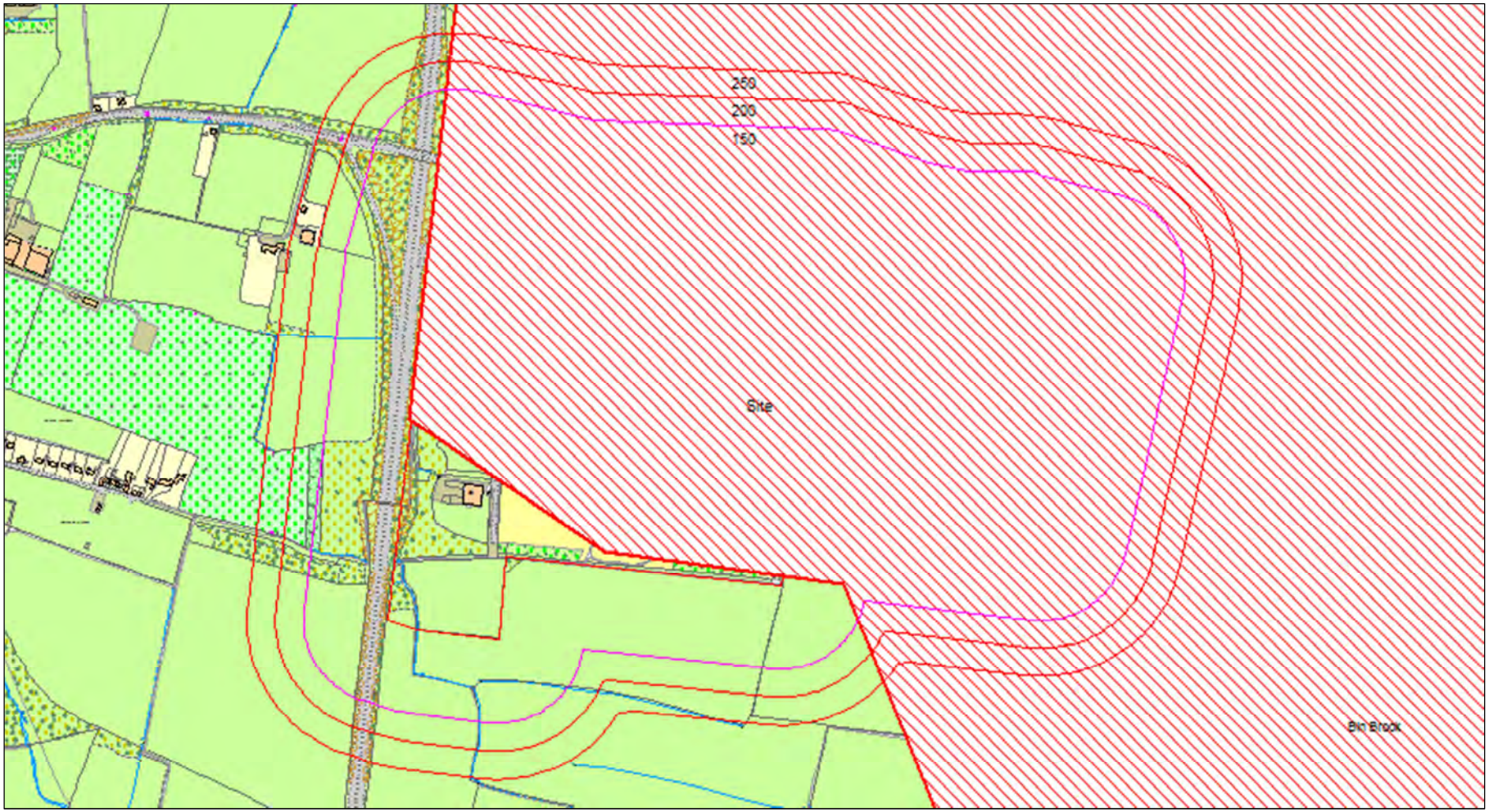
Key	Layer Name	Search Distance	Selected?	No. Selected
	Total County Wide Wetspots DV	0 m	Yes	1
	Enforcement	150 m	No	0
	Flood Investigations	150 m	No	0
	Pre-applications-consents	150 m	No	0
	Formal Application - Consents	150 m	No	0
	Gravity discharge outfall	0 m	No	0
	Flood storage reservoir	0 m	No	0
	Balancing pond	0 m	No	0
	Flood defence wall	0 m	No	0
	Flood defence bank	0 m	No	0
	Inlet	0 m	No	0
	Culvert	200 m	No	0
	Bridges	150 m	No	0
	Piped Watercourse	200 m	No	0
	Awarded Watercourses	200 m	No	0
	Inspection Chamber	150 m	Yes	9
	Gully	150 m	Yes	24
	Lock	0 m	No	0
	Ordinary Watercourse	0 m	No	0
	Pumping station	0 m	No	0
	Sewer	0 m	No	0
	Sluice gate	0 m	No	0
	Spillway	0 m	No	0
	Syphon	0 m	No	0
	Telemetry	0 m	No	0
	Weir	0 m	No	0
	Weedscreen	0 m	No	0

End of summary report

4. Site Location Map



5. Layer Name: Total County Wide Wetspots DV

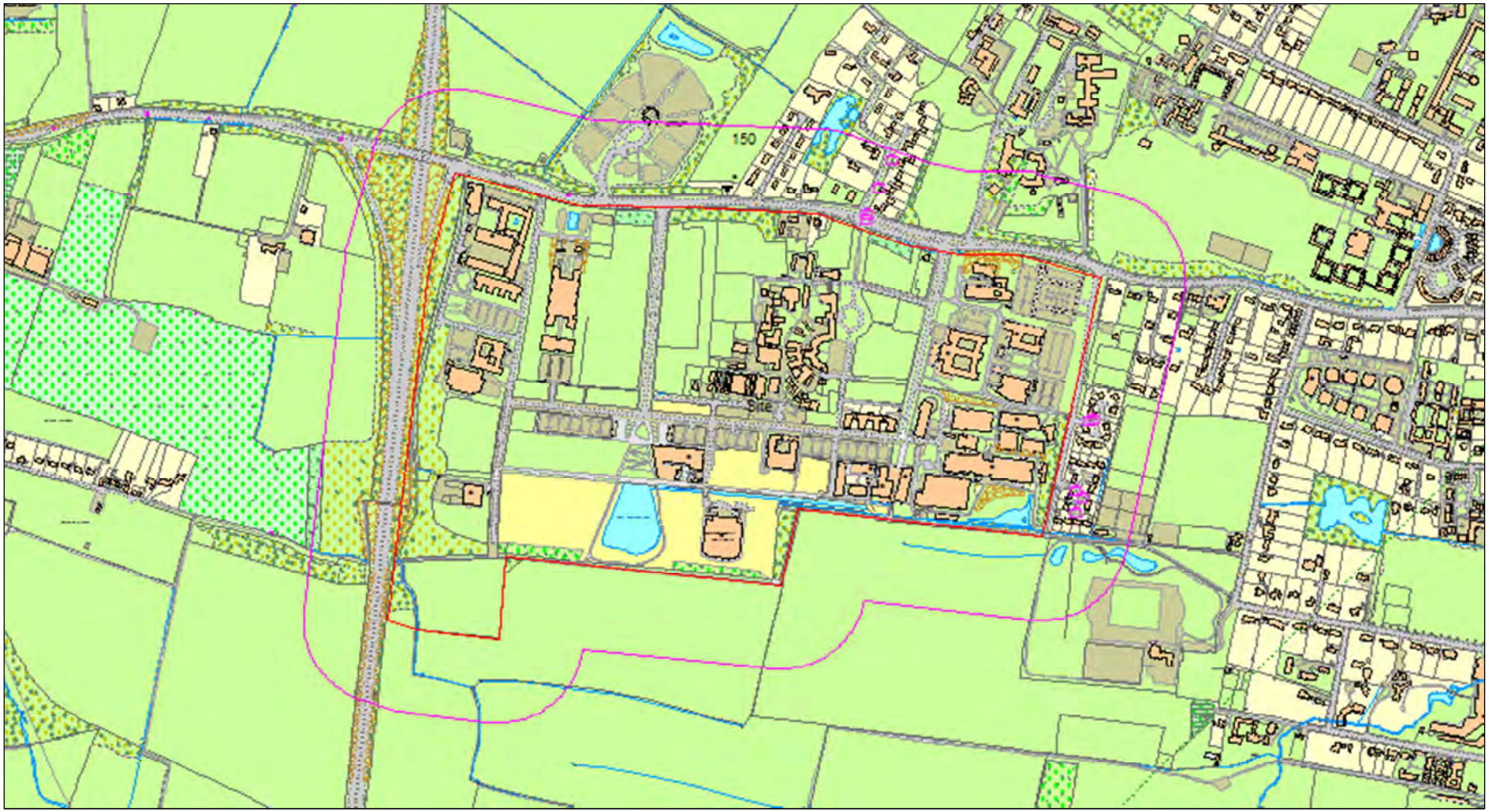


5.1 GIS Attribute Data for Total County Wide Wetspots DV

Total of 1 record(s) identified within 0 metres
1 record(s) identified on site.

Record 1 of 1
Area: Bin Brook
District: Cambridge City
Area_Ha: 435.199
Deep_200yr: 0
Shallow_200yr: 0
MCA_Score: 0
Why_Defined: No Data
Main_River_Only: No Data
Agri_1_ha: 0
Agri_2_ha: 0
Agri_3_ha: 0
Agri_4_ha: 0
Agri_5_ha: 0
Agri_6_ha: 0
Agri_7_ha: 0
Agri_1_ha_Deep: 0
Agri_1_ha_Shallow: 0
Agri_2_ha_Deep: 0
Agri_2_ha_Shallow: 0
Agri_3_ha_Deep: 0
Agri_3_ha_Shallow: 0

6. Layer Name: Inspection Chamber

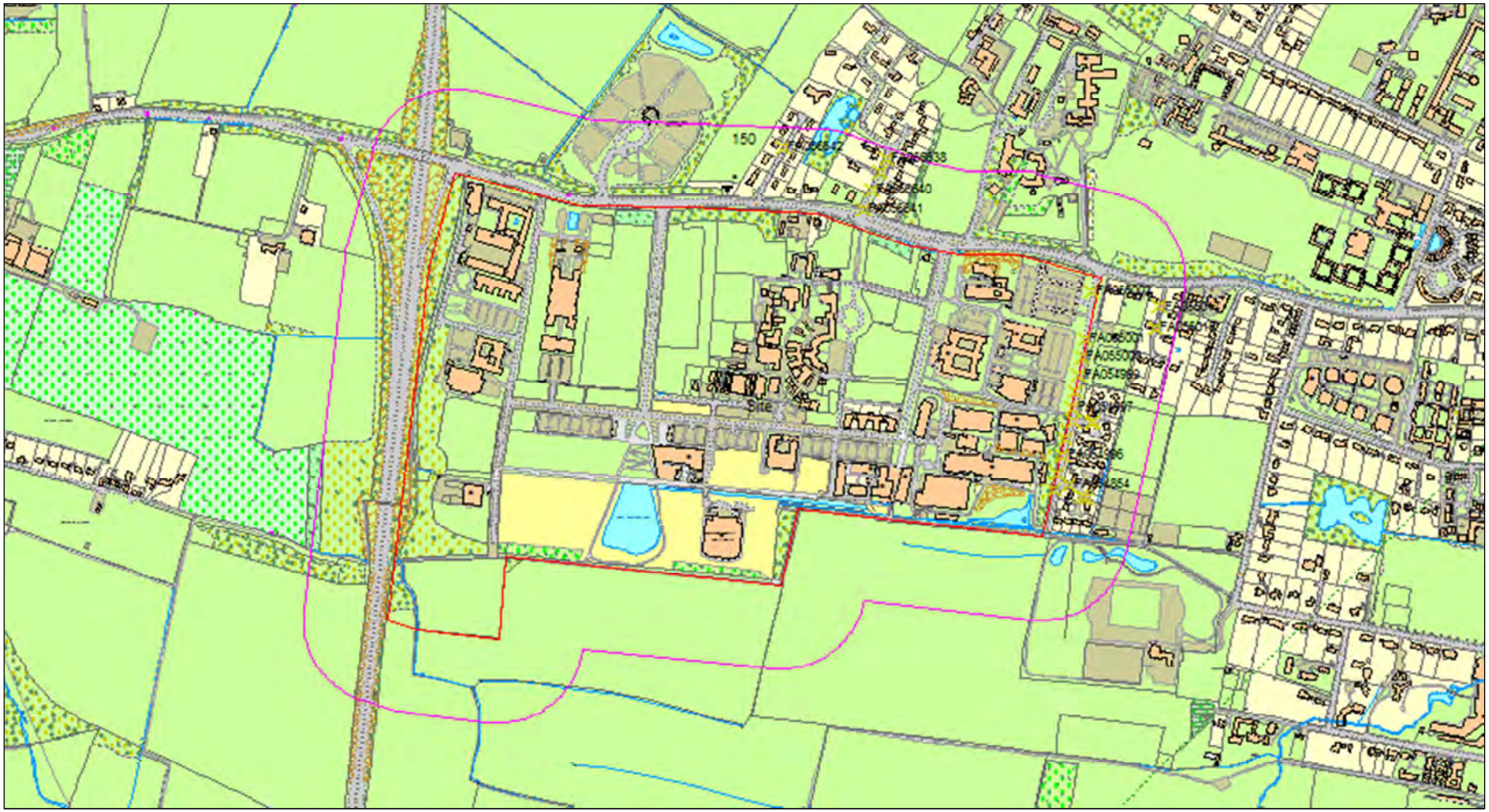


7.1 GIS Attribute Data for Inspection Chamber

Key: Symbols -

site_seq_n	site_id	site_nar	site_typ	site_addre	location_nar	invert_lev	principal_materia	Grid Ref.
On site								
None								
Off site - Within 150m								
100320890	FA010890	FA010890	Inspection Chamber	No data	No data	No data	No data	543252, 258778
100320891	FA010891	FA010891	Inspection Chamber	No data	No data	No data	No data	543242, 258788
100320892	FA010892	FA010892	Inspection Chamber	No data	No data	No data	No data	543264, 258913
100320893	FA010893	FA010893	Inspection Chamber	No data	No data	No data	No data	543274, 258916
100321061	FA011061	FA011061	Inspection Chamber	No data	No data	No data	No data	542916, 259375
100321062	FA011062	FA011062	Inspection Chamber	No data	No data	No data	No data	542893, 259327
100321063	FA011063	FA011063	Inspection Chamber	No data	No data	No data	No data	542871, 259280
100321072	FA011072	FA011072	Inspection Chamber	No data	No data	No data	No data	542870, 259271
100321232	FA011232	FA011232	Inspection Chamber	No data	No data	No data	No data	543241, 258750

8. Layer Name: Gully



8.1 GIS Attribute Data for Gully

Key: Symbols - 

site_seq_n	id	site_type	site_addres	location_nar	status	asset_own	Grid Ref.
On site							
100365001	FA055001	Gully	No data	FA055001	No data	Unknown	543258, 259053
100365002	FA055002	Gully	No data	FA055002	No data	Unknown	543271, 259138
Off site - Within 150m							
100364854	FA054854	Gully	No data	FA054854	No data	Unknown	543231, 258796
100364855	FA054855	Gully	No data	FA054855	No data	Unknown	543254, 258776
100364856	FA054856	Gully	No data	FA054856	No data	Unknown	543262, 258772
100364994	FA054994	Gully	No data	FA054994	No data	Unknown	543204, 258786
100364995	FA054995	Gully	No data	FA054995	No data	Unknown	543211, 258816
100364996	FA054996	Gully	No data	FA054996	No data	Unknown	543219, 258848
100364997	FA054997	Gully	No data	FA054997	No data	Unknown	543237, 258932
100364998	FA054998	Gully	No data	FA054998	No data	Unknown	543243, 258961
100364999	FA054999	Gully	No data	FA054999	No data	Unknown	543248, 258991
100365000	FA055000	Gully	No data	FA055000	No data	Unknown	543253, 259022
100365003	FA055003	Gully	No data	FA055003	No data	Unknown	543225, 258878
100365004	FA055004	Gully	No data	FA055004	No data	Unknown	543240, 258910
100365005	FA055005	Gully	No data	FA055005	No data	Unknown	543272,

site_seq_n	id	site_type	site_addre	location_nar	status	asset_own	Grid Ref.
							258907
100365006	FA055006	Gully	No data	FA055006	No data	Unknown	543273, 258908
100365015	FA055015	Gully	No data	FA055015	No data	Unknown	543383, 259074
100365016	FA055016	Gully	No data	FA055016	No data	Unknown	543383, 259075
100365017	FA055017	Gully	No data	FA055017	No data	Unknown	543391, 259111
100366638	FA056638	Gully	No data	FA056638	No data	Unknown	542906, 259376
100366639	FA056639	Gully	No data	FA056639	No data	Unknown	542896, 259351
100366640	FA056640	Gully	No data	FA056640	No data	Unknown	542880, 259319
100366641	FA056641	Gully	No data	FA056641	No data	Unknown	542865, 259283
100366642	FA056642	Gully	No data	FA056642	No data	Unknown	542724, 259394

End of detailed report

8 Wetspot Selection and Prioritisation

Flood Risk Regulations
The assessment of the possible harmful consequences of future floods from local sources of flood risk

8.1 Approach

The principal purpose of a strategic assessment is to identify broad locations which are considered more or less vulnerable to surface water flooding. These are then taken through an intermediate assessment. This chapter describes the selection and prioritisation of areas in line with the strategic and intermediate risk assessment phases. This section is divided into three sub-sections to facilitate the above objective. These are:

- Identification of Potential Wetspot Areas within Cambridge and Milton using the results of the bare earth modelling described in Section 7. This is referred to as Stage 2 of the modelling strategy
- Multi-Criteria Assessment (MCA) Methodology. This describes the agreed MCA approach agreed with the SWMP Project Board.
- Prioritisation of Wetspots within Cambridge and Milton using the MCA methodology.

The objective of the MCA assessment and prioritisation is the identification of two agreed wetspots to be taken forward to the intermediate assessment stage. The workflow to establish the prioritisation is shown in Figure 2.2

8.2 Stage 2 - Identification of Potential Wetspot Areas

A wetspot is an area deemed to be at significant risk of surface water flooding. This risk is identified using either historical flooding reports and / or the Environment Agency‘s Flood Maps and localised modelling. A number of principles were established in relation to identifying wetspot areas within the Cambridge and Milton SWMP. These were:

- The wetspots were initially identified by depth using the Stage 1 bare earth modelling of north and south Cambridge, historical data and supporting information from Cambridge City Council.
- The wetspots must include all of the upstream contributing areas to ensure that flood flows to the area where water accumulates are considered by the detailed assessment. In order to meet this criterion the velocity and flow outputs from the Stage 1 bare earth model were interrogated to delineate the wetspot, sub-catchment areas.

Figure 8.1 shows the results of the Stage 1 bare earth modelling for a 1 in 200 year (0.5% AEP) return period for Cambridge. Areas of inundation shown in blue are equivalent to a flood depth of between 0.1m and 0.3m. Areas of inundation shown red are equivalent to flood depths greater than 0.3m. The figures allow a preliminary delineation of the wetspot catchments. In particular, there is clearly a well defined accumulation area on the axis of Perne Road and Cherry Hinton Road. There is also evidence of historical flooding within the St Thomas Square area to support the modelling.

Based solely on depth the distinction between various wetspots is less clear to the north of the Cam where there appears to be several separate areas of accumulation. In order to address

Figure Ref	Wetspot
8.3	Bin Brook
8.4	Vicar‘s Brook / Hobson‘s Conduit
8.5	Cherry Hinton
8.6	Cherry Hinton Village
8.7	Coldham‘s Common
8.8	Milton Village
8.9	North Chesterton
8.10	South Chesterton
8.11	Castle School
8.12	King‘s Hedges and Arbury
8.13	Cambridge City Centre

Table 8.1 Stage 2 Wetspots for Cambridge and Milton and their associated figure numbers

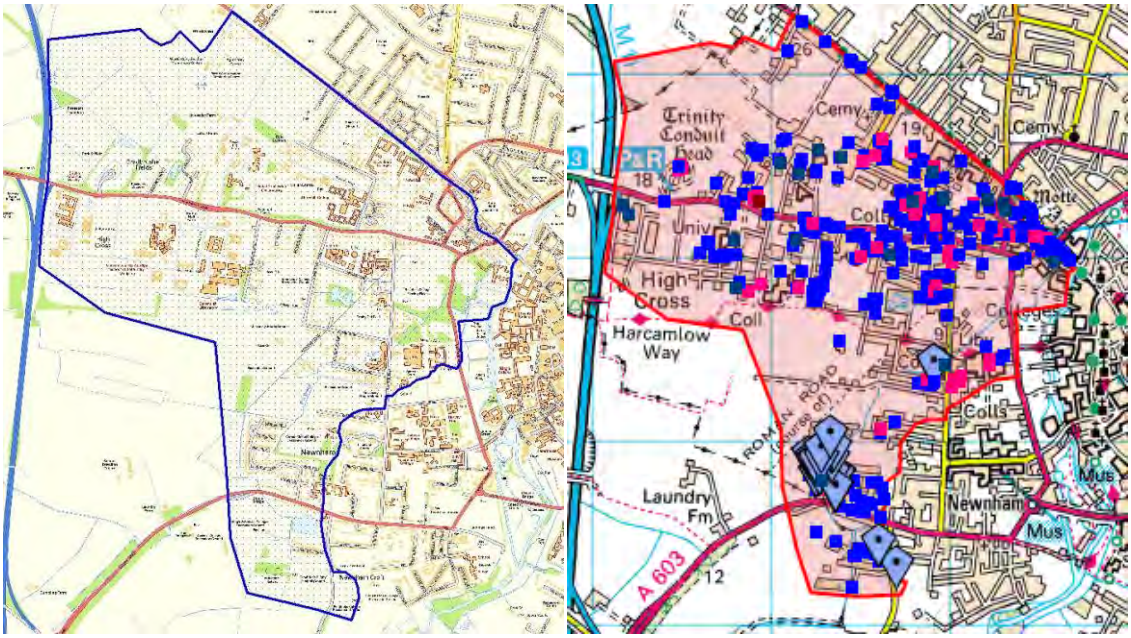


Figure 8-3 Location of Bin Brook wetspot

Appendix N Environment Agency Data

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Appendix O Indicative Construction Phasing Plans

LEGEND

- PHASE 1 PROPOSED DRAINAGE
- PHASE 1 DRAINAGE TO BE REMOVED
- PHASE 2 PROPOSED DRAINAGE
- PHASE 2 DRAINAGE TO BE REMOVED
- PHASE 3 PROPOSED DRAINAGE
- PHASE 3 DRAINAGE TO BE REMOVED

NOTES

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Mark	Revision	Date	Drawn	Chkd	Appd

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PRELIMINARY

SURFACE WATER AND FOUL WATER DRAINAGE PHASING PLAN (OVERVIEW SHEET) WEST CAMBRIDGE Ddensification

Client

UNIVERSITY OF CAMBRIDGE

Date of 1st Issue	Designed	Drawn
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A0 Scale	Checked	Approved
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Drawing Number		Revision
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LEGEND

- PHASE 1 PROPOSED DRAINAGE
- PHASE 1 DRAINAGE TO BE REMOVED
- PHASE 2 PROPOSED DRAINAGE
- PHASE 2 DRAINAGE TO BE REMOVED
- PHASE 3 PROPOSED DRAINAGE
- PHASE 3 DRAINAGE TO BE REMOVED

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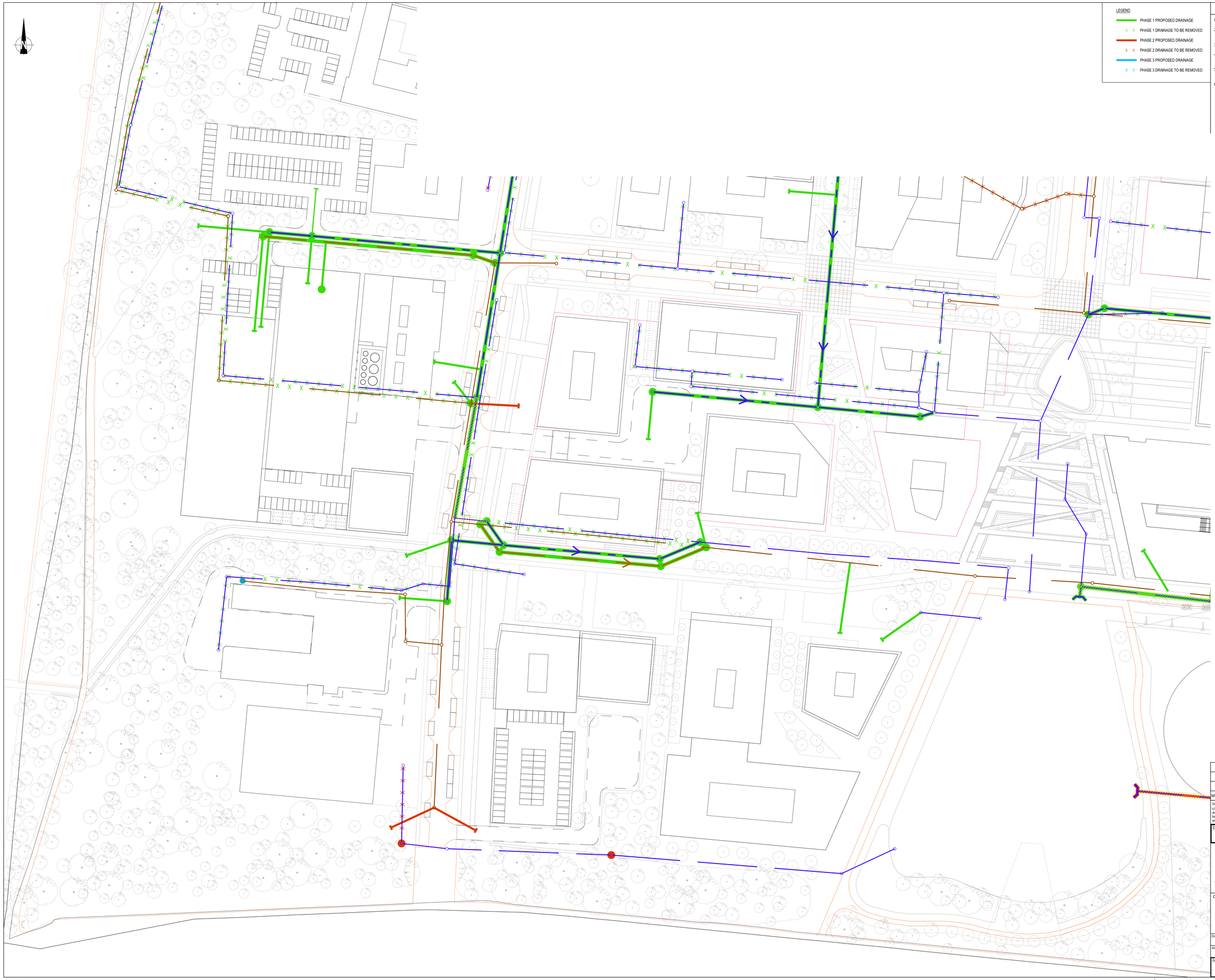

LEGEND

- PHASE 1 PROPOSED DRAINAGE
- PHASE 1 DRAINAGE TO BE REMOVED
- PHASE 2 PROPOSED DRAINAGE
- PHASE 2 DRAINAGE TO BE REMOVED
- PHASE 3 PROPOSED DRAINAGE
- PHASE 3 DRAINAGE TO BE REMOVED

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DRAINAGE PHASING PLAN
SHEET 2 OF 6
WEST CAMBRIDGE Ddensification

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- PHASE 1 DRAINAGE TO BE REMOVED
- PHASE 2 PROPOSED DRAINAGE
- PHASE 2 DRAINAGE TO BE REMOVED
- PHASE 3 PROPOSED DRAINAGE
- PHASE 3 DRAINAGE TO BE REMOVED

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- PHASE 1 PROPOSED DRAINAGE
- PHASE 1 DRAINAGE TO BE REMOVED
- PHASE 2 PROPOSED DRAINAGE
- PHASE 2 DRAINAGE TO BE REMOVED
- PHASE 3 PROPOSED DRAINAGE
- PHASE 3 DRAINAGE TO BE REMOVED

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Drawing Issue Status

PRELIMINARY

SURFACE WATER AND FOUL WATER DRAINAGE PHASING PLAN SHEET 4 OF 6 WEST CAMBRIDGE DENSIFICATION

Client

UNIVERSITY OF CAMBRIDGE

Date of 1st Issue	Designed	Drawn
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Drawing Issue Status

PRELIMINARY

SURFACE WATER AND FOUL WATER DRAINAGE PHASING PLAN
SHEET 5 OF 6
WEST CAMBRIDGE DENSIFICATION

Client

UNIVERSITY OF CAMBRIDGE

Date of 1st Issue	Designed	Drawn
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LEGEND

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- PHASE 1 DRAINAGE TO BE REMOVED
- PHASE 2 PROPOSED DRAINAGE
- PHASE 2 DRAINAGE TO BE REMOVED
- PHASE 3 PROPOSED DRAINAGE
- PHASE 3 DRAINAGE TO BE REMOVED

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Drawing Issue Status

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SURFACE WATER AND FOUL WATER DRAINAGE PHASING PLAN
SHEET 6 OF 6
WEST CAMBRIDGE DENSIFICATION

Client

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Date of 1st Issue	Designed	Drawn
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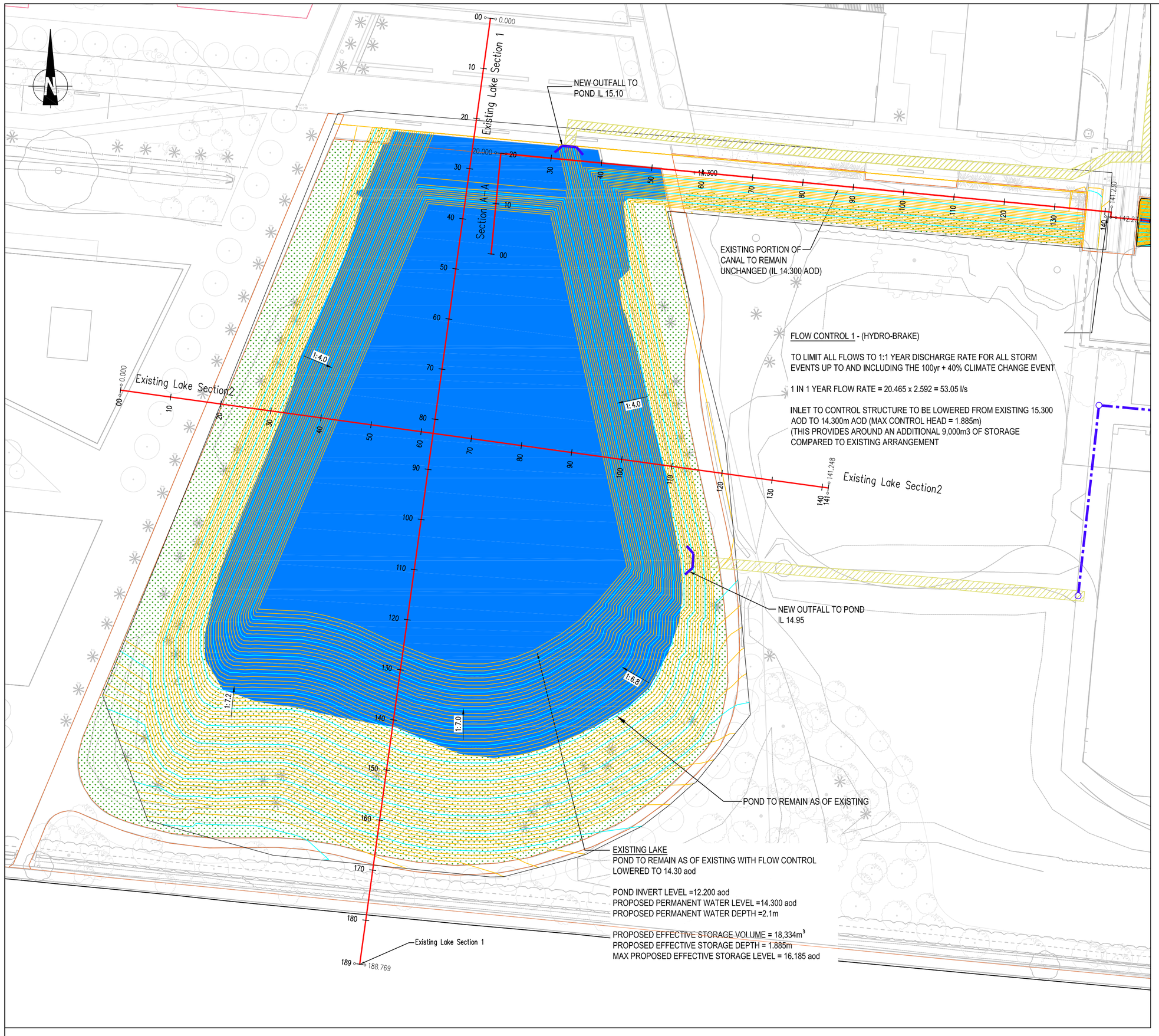
Appendix P Proposed Drainage Strategy – Surface/Foul Water Network (Sheets 1 – 6) Long Sections Western Lake and Canal

Long Sections Western Lake and Canal



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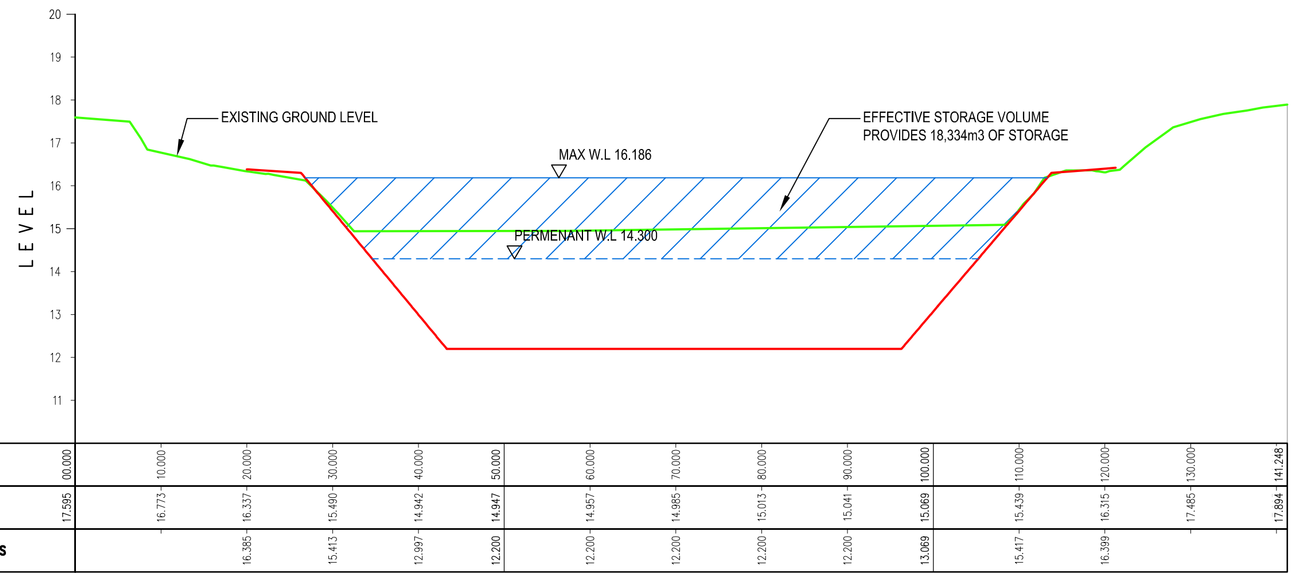
EXISTING LAKE SECTION2
SCALE: H 1:500, V 1:100. DATUM: 10.000



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EXISTING LEVELS	17.595	16.773	16.337	15.450	14.942	14.947	14.957	14.985	15.013	15.041	15.069	15.439	16.315	17.485	17.894
PROPOSED LEVELS			16.385	15.413	12.997	12.200	12.200	12.200	12.200	12.200	13.669	15.417	16.399		

EXISTING LAKE SECTION 1
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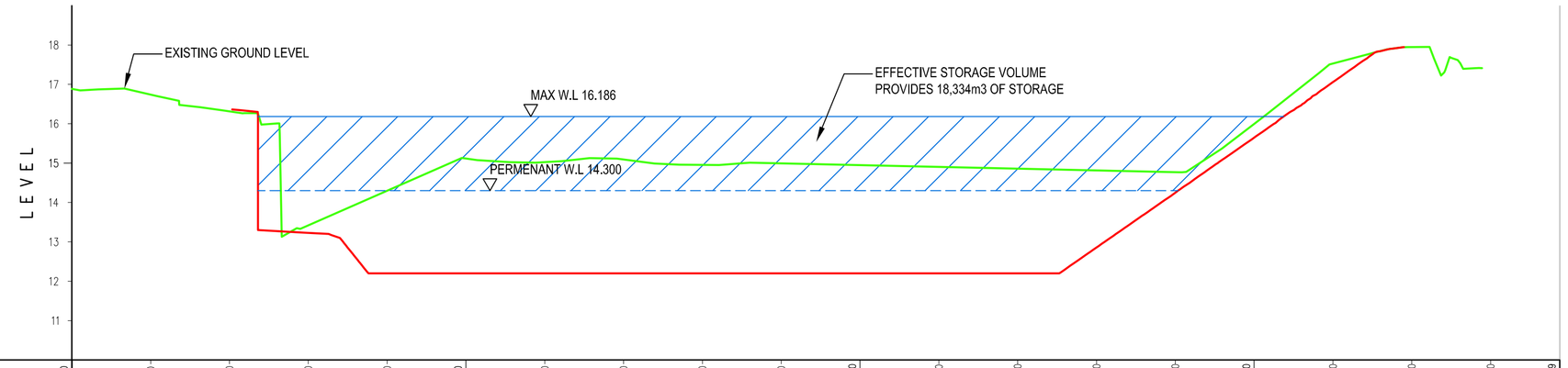

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EXISTING LEVELS	16.884	16.739	16.314	13.420	14.298	15.116	15.024	15.091	14.956	14.994	14.950	14.905	14.860	14.816	14.771	15.996	17.529	17.947		
PROPOSED LEVELS				13.229	12.200	12.200	12.200	12.200	12.200	12.200	12.200	12.200	12.200	12.857	14.249	15.647	17.058			

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INDICATIVE WORKS TO EXISTING DRAINAGE INFRASTRUCTURE WEST CAMBRIDGE DENSIFICATION (SHEET 1 OF 3)

Client

WEST CAMBRIDGE

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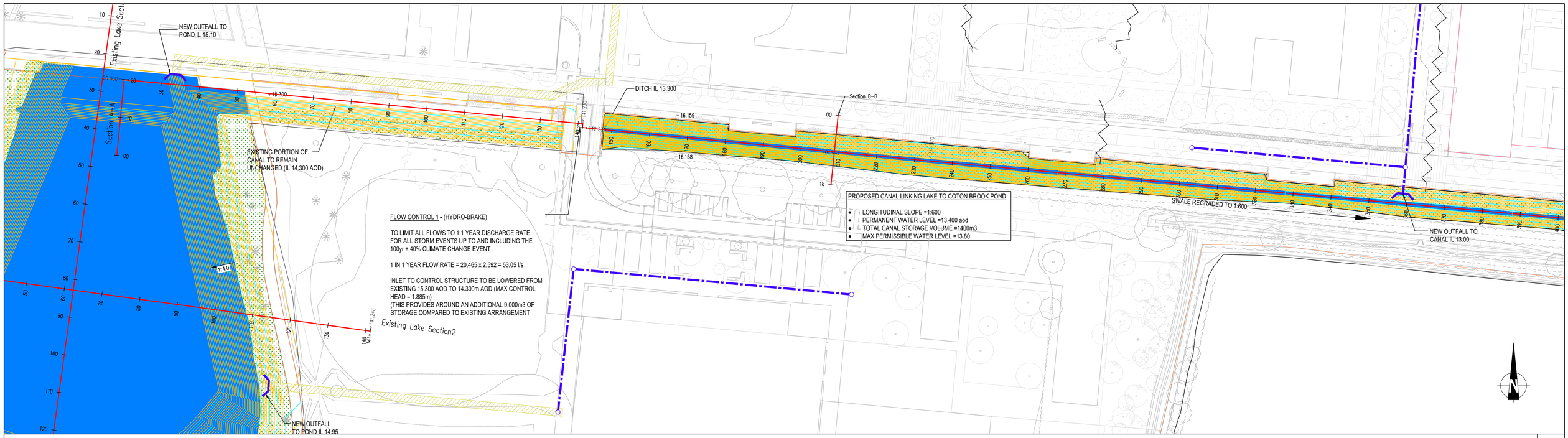

SECTION A–A_PV26
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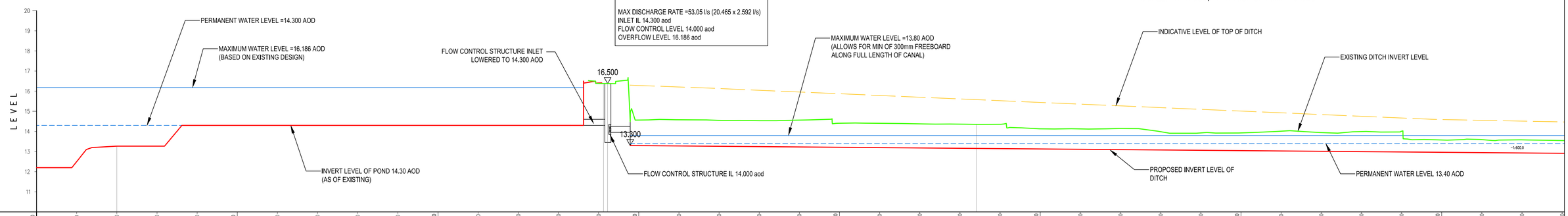

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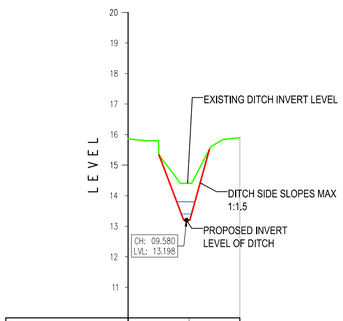
EXISTING LEVELS					14.300	14.300	14.300	14.300	14.300	14.300	14.300	14.300	14.300	14.300	16.385	14.565	14.580	14.551	14.533	14.563	14.409	14.403	14.377	14.362	14.355	14.128	14.126	14.146	13.987	13.925	13.926	14.013	13.941	13.992	14.009	13.574	13.594	13.582	13.586	
PROPOSED LEVELS																13.296	13.280	13.263	13.246	13.230	13.213	13.196	13.180	13.163	13.146	13.130	13.113	13.096	13.080	13.063	13.046	13.030	13.013	12.996	12.980	12.963	12.946	12.930	12.913	

SECTION B–B
SCALE: H 1:500, V 1:100. DATUM: 10.000



CHAINAGE	00.000	10.000	18.308
EXISTING LEVELS	15.860	14.407	15.897
PROPOSED LEVELS		13.198	

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INDICATIVE WORKS TO EXISTING DRAINAGE INFRASTRUCTURE WEST CAMBRIDGE DENSIFICATION (SHEET 2 OF 3)

Client
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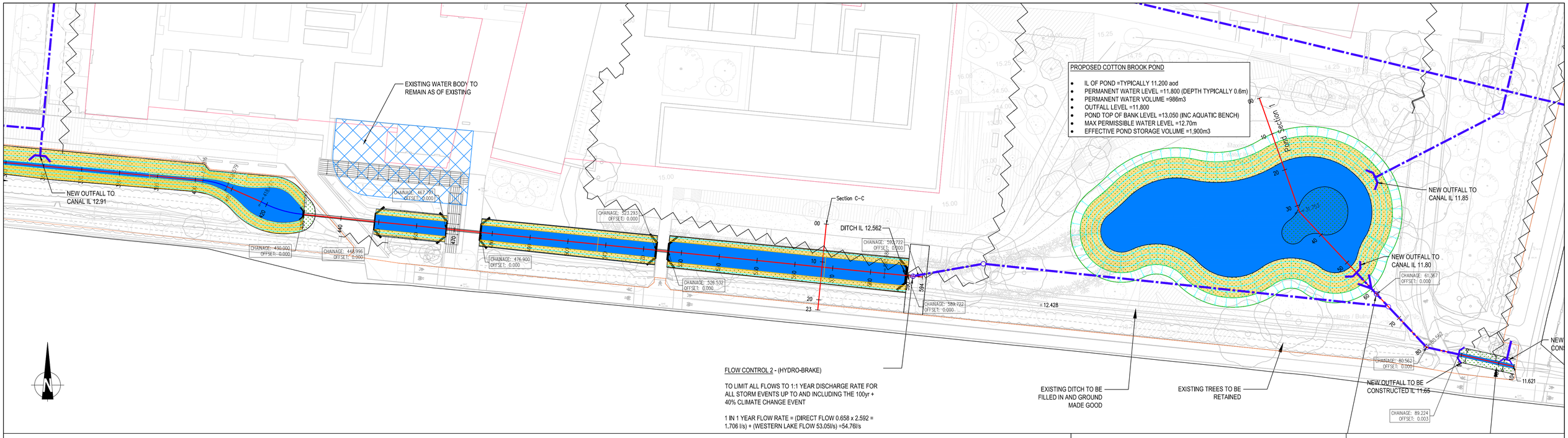

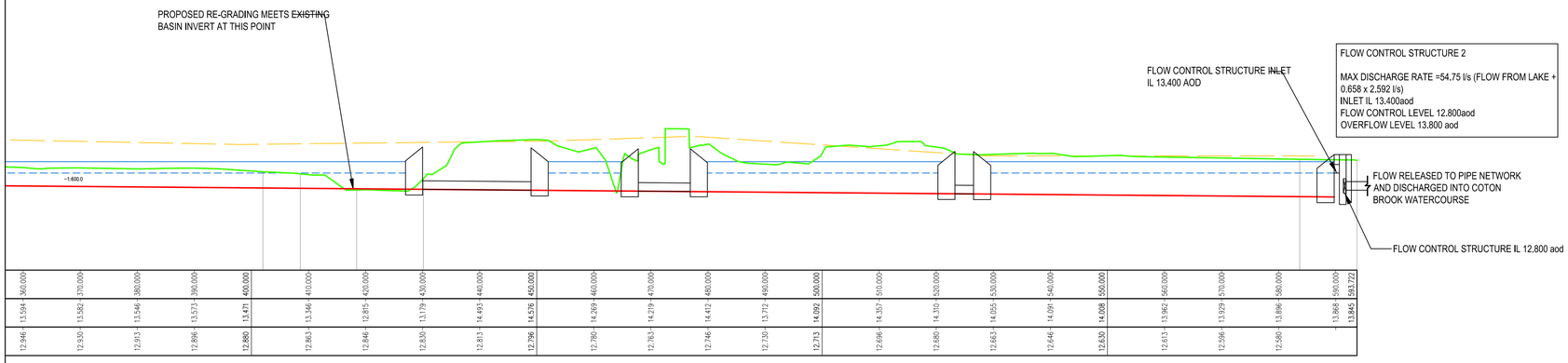

SECTION C–C
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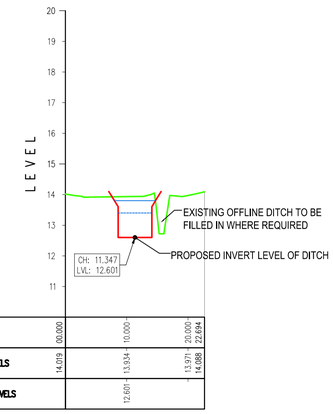

POND SECTION 1_PV27
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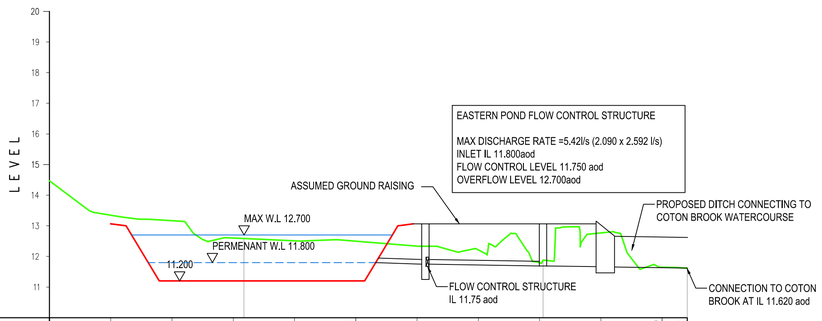

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INDICATIVE WORKS TO EXISTING DRAINAGE INFRASTRUCTURE WEST CAMBRIDGE DENSIFICATION (SHEET 3 OF 3)

Client
WEST CAMBRIDGE

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Appendix Q Greenfield Run Off Rate Calculations (1oH 124 Method)

Job no:	31500
Calculation by:	CLW
Checked by:	
Date:	15/01/2015

Telford House
Fulbourn
Cambridge
CB1 5HB

Telephone 01223 882000
Fax 01223 881888
e-mail cambridge@hannahreed.co.uk

Notes

The purpose of this calculation is to re-estimate greenfield run-off rates for a development site off Madingley Road, Cambridge

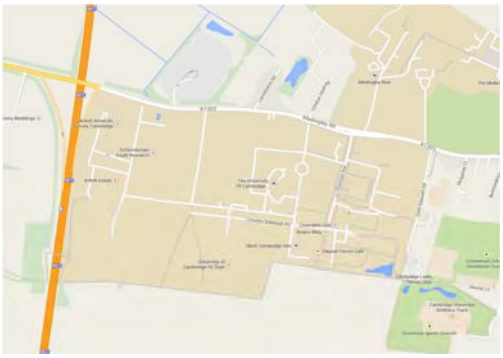
Calculation Brief

Calculate greenfield run-off rates for Madingley Road development:

- Rates previously estimated under job code:
- New plans to infill additional development on site
- EA have requested betterment to improve existing flood risk to properties downstream
- Sensitivity and range of greenfield estimates and QBAR required.

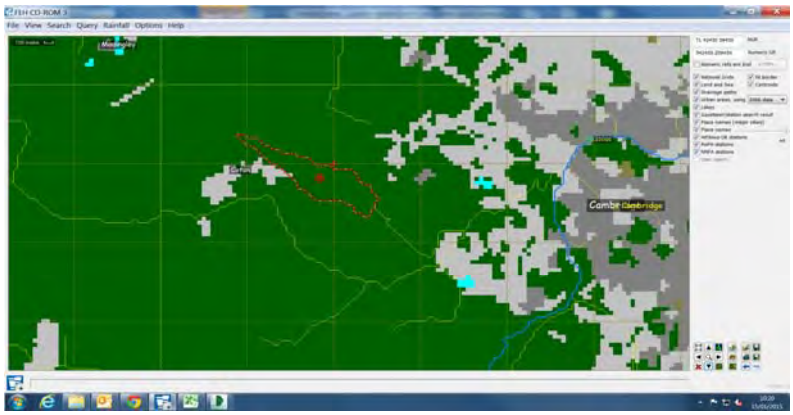
Site Overview

West Cambridge site is located between Madingley Road (A1303) and the M11, at approximately TL 426 590.
The site has been recently developed and drains south-eastwards via balancing ponds to Coton Brook.



Catchment Descriptors

The nearest catchment on the FEH CD-Rom appears to be: TL 42450 58450



VERSION	FEH CD-RO	Version		3	exported at
CATCHMEI	GB		542450	258450	TL 42450 58450
CENTROID	GB		541839	258808	TL 41839 58808
AREA	0.5				
ALTBAR	22				
ASPBAR	141				
ASPVAR	0.69				
BFIHOST	0.284				Not permeable
DPLBAR	0.96				
DPSBAR	14.7				
FARL	1				No reservoir influence
FPEXT	0.1443				
FPDBAR	0.587				
FPLOC	0.626				
LDP	2.18				
PROPWET	0.26				
RMED-1H	10.8				
RMED-1D	28.7				
RMED-2D	35.1				
SAAR	553				
SAAR4170	552				
SPRHOST	57.81				Not permeable
URBCONC1	-999999				
URBEXT19	0				Not urban
URBLOC19	-999999				
URBCONC2	-999999				
URBEXT20	0.0025				Not urban
URBLOC20	-999999				
C	-0.02629				
D1	0.31375				
D2	0.26481				
D3	0.29901				
E	0.318				
F	2.44303				
C(1 km)	-0.026				
D1(1 km)	0.315				
D2(1 km)	0.261				
D3(1 km)	0.301				
E(1 km)	0.318				
F(1 km)	2.442				

Method Statement

EA Flow Estimation Guidelines recommends using FEH methods for small catchments and greenfield runoff, following SC090031.

"The current versions of the FEH statistical approach or the ReFH rainfall-runoff model should be used ... For catchments smaller than 0.5 km2, runoff estimates should be derived from FEH methods applied to the nearest suitable catchment above 0.5 km2 for which descriptors can be derived from the FEH CD-Rom and scaled down by the ratio of catchment areas".

IoH 124 is however commonly recommended for greenfield runoff estimation in a wide range of guidance documents including the SUDS manual. This recommendation was aimed largely at meeting the pragmatic needs of the industry, as the calculation is more straightforward.

In this study, use both IoH124 and ReFH methods and compare results.

Previous Greenfield Runoff Calcs

Extract from Phase 3 Infrastructure Surface Water Drainage Calculations (C-208087/RevA/August 2010):

In order to avoid an excessively large lake the Environment Agency (EA) has agreed to a staged outfall from the attenuation facility with discharge limited to the equivalent rural run-off rates for 100%, 3.33% and 1% annual probability rainfall events.

Rural run-off rates were estimated using the IoH124 method for a 50ha area, adjusted on a pro-rata basis to suit the actual catchment being considered here. This pro-rata adjustment follows the guidelines set out within IoH124.

Return Period	50 ha (l/s)	l/s/ha
100% (1yr)	144.1	2.88
3.33% (30yr)	398.0	7.96
1% (100yr)	589.7	11.79

The retained water level of the lake will be 15.30m AOD, this level will be maintained by a weir within the control structure. Discharge from the lake will be controlled by three in line staged vortex controls (Hydrobrakes) designed to regulate flows to the rural run-off rates described above. The calculations indicate that the top water level generated by a 1 in 100 year event + 30%cc will be 16.186m AOD, and this will be the level of the emergency overflow weir within the control structure. An extreme rainfall event may generate a higher water level, and in such a situation water will overflow the weir and into the swale. The swale will convey the flow to the Coton Ditch, which flows in an easterly direction to its outfall into a drain which runs beneath the Emmanuel College sports ground and into the sewer system on Wilberforce Road. Downstream protection to the more urban residential catchment will be achieved by the restriction on flow imposed by this 450mm diameter drain, with any above ground flooding contained within the sports ground area in the vicinity of the drain's inlet.

IH 124 Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	550.000	Urban	0.000
Area (Ha)	50.000	Soil	0.450	Region Number	5

Results	l/s
QBAR Rural	165.7
QBAR Urban	165.7
Q 100 years	589.7
Q 1 year	144.1
Q 2 years	148.0
Q 5 years	213.7
Q 10 years	274.2
Q 20 years	346.3
Q 25 years	374.7
Q 30 years	398.0
Q 50 years	470.8
Q 100 years	589.7
Q 200 years	694.1
Q 250 years	727.2
Q 1000 years	954.2

Previous greenfield runoff estimates are as follows:

1 yr	2.88 l/s/ha
30 yr	7.96 l/s/ha
100 yr	11.79 l/s/ha

IoH 124 Method Summary

See separate IoH124 calculation sheet.

Summary of results:

Input data:	Area	0.5		
	SAAR	553		
	Soil	0.45		
	Region	5		
				Previous assessment:
Results:	QBAR	3.33	l/s/ha	3.31
	2 yr	2.97	l/s/ha	2.96
	30 yr	7.89	l/s/ha	7.96
	100 yr	11.87	l/s/ha	11.79

These results support those of the previous IoH124 assessment in MicroDrainage.

ReFH Method Summary

Catchment descriptors were input to a ReFH unit in ISIS.
Storm duration optimised to 6.1 hrs for 100 yr event.
All other options set to default.

Peak flow (m3/s)	0.177	0.382	0.515
Peak flow (l/s/ha)	3.54	7.64	10.3

Time (hr)	WCamb_2y	WCamb_30	WCamb_100yr
0	0.0138	0.0138	0.0138
0.1	0.0138	0.0138	0.0138
0.2	0.0137	0.0138	0.0138
0.3	0.0137	0.0138	0.0139
0.4	0.0138	0.0139	0.014
0.5	0.0138	0.0141	0.0143
0.6	0.0139	0.0143	0.0146
0.7	0.014	0.0146	0.015
0.8	0.0142	0.015	0.0154
0.9	0.0144	0.0155	0.016
1	0.0146	0.016	0.0167
1.1	0.0149	0.0167	0.0176
1.2	0.0153	0.0174	0.0185
1.3	0.0156	0.0183	0.0197
1.4	0.0161	0.0193	0.021
1.5	0.0166	0.0204	0.0225
1.6	0.0173	0.0218	0.0242
1.7	0.0179	0.0232	0.0261
1.8	0.0187	0.0249	0.0282
1.9	0.0196	0.0268	0.0307
2	0.0206	0.029	0.0334
2.1	0.0217	0.0314	0.0365
2.2	0.023	0.034	0.04
2.3	0.0244	0.037	0.0439
2.4	0.0259	0.0403	0.0482
2.5	0.0277	0.0441	0.053
2.6	0.0296	0.0482	0.0584
2.7	0.0318	0.0528	0.0643
2.8	0.0341	0.0579	0.071
2.9	0.0367	0.0635	0.0784
3	0.0396	0.0697	0.0866
3.1	0.0428	0.0766	0.0956
3.2	0.0463	0.0841	0.106
3.3	0.05	0.0922	0.116
3.4	0.0539	0.101	0.128
3.5	0.058	0.11	0.14
3.6	0.0624	0.119	0.152
3.7	0.0668	0.129	0.166
3.8	0.0715	0.139	0.179

3.9	0.0762	0.15	0.193
4	0.081	0.161	0.208
4.1	0.086	0.172	0.222
4.2	0.0909	0.183	0.237
4.3	0.096	0.194	0.253
4.4	0.101	0.205	0.268
4.5	0.106	0.217	0.283
4.6	0.111	0.228	0.299
4.7	0.116	0.239	0.314
4.8	0.121	0.251	0.33
4.9	0.126	0.262	0.345
5	0.131	0.273	0.36
5.1	0.136	0.284	0.375
5.2	0.14	0.294	0.39
5.3	0.145	0.305	0.404
5.4	0.149	0.315	0.418
5.5	0.153	0.324	0.431
5.6	0.157	0.333	0.443
5.7	0.161	0.342	0.455
5.8	0.164	0.35	0.466
5.9	0.167	0.357	0.477
6	0.17	0.363	0.486
6.1	0.172	0.369	0.494
6.2	0.174	0.373	0.5
6.3	0.175	0.377	0.506
6.4	0.176	0.38	0.51
6.5	0.177	0.381	0.513
6.6	0.177	0.382	0.514
6.7	0.177	0.382	0.515
6.8	0.177	0.382	0.514
6.9	0.176	0.381	0.513
7	0.175	0.379	0.511
7.1	0.174	0.376	0.508
7.2	0.172	0.373	0.504
7.3	0.171	0.37	0.5
7.4	0.169	0.366	0.495
7.5	0.167	0.362	0.49
7.6	0.165	0.358	0.484
7.7	0.162	0.353	0.477
7.8	0.16	0.348	0.47
7.9	0.158	0.342	0.463
8	0.155	0.337	0.456
8.1	0.152	0.331	0.448
8.2	0.15	0.325	0.44
8.3	0.147	0.319	0.432
8.4	0.144	0.313	0.423
8.5	0.141	0.306	0.415
8.6	0.138	0.3	0.406
8.7	0.136	0.294	0.398
8.8	0.133	0.287	0.389

8.9	0.13	0.281	0.38
9	0.127	0.274	0.372
9.1	0.124	0.268	0.363
9.2	0.121	0.262	0.355
9.3	0.119	0.256	0.346
9.4	0.116	0.25	0.338
9.5	0.114	0.244	0.33
9.6	0.111	0.239	0.323
9.7	0.109	0.233	0.315
9.8	0.106	0.228	0.308
9.9	0.104	0.223	0.301
10	0.102	0.218	0.295
10.1	0.0998	0.213	0.288
10.2	0.0977	0.209	0.282
10.3	0.0957	0.204	0.275
10.4	0.0936	0.2	0.269
10.5	0.0917	0.195	0.263
10.6	0.0897	0.191	0.257
10.7	0.0878	0.186	0.251
10.8	0.0859	0.182	0.246
10.9	0.084	0.178	0.24
11	0.0822	0.174	0.234
11.1	0.0803	0.17	0.229
11.2	0.0785	0.166	0.223
11.3	0.0767	0.162	0.218
11.4	0.0749	0.158	0.213
11.5	0.0732	0.154	0.207
11.6	0.0714	0.15	0.202
11.7	0.0697	0.146	0.197
11.8	0.068	0.142	0.192
11.9	0.0663	0.139	0.187
12	0.0646	0.135	0.182
12.1	0.0629	0.131	0.177
12.2	0.0613	0.128	0.172
12.3	0.0596	0.124	0.167
12.4	0.058	0.12	0.162
12.5	0.0564	0.117	0.157
12.6	0.0548	0.113	0.152
12.7	0.0533	0.11	0.147
12.8	0.0517	0.106	0.143
12.9	0.0501	0.103	0.138
13	0.0486	0.0995	0.133
13.1	0.0471	0.0961	0.129
13.2	0.0456	0.0928	0.124
13.3	0.0442	0.0896	0.12
13.4	0.0428	0.0864	0.116
13.5	0.0414	0.0833	0.111
13.6	0.0401	0.0803	0.107
13.7	0.0387	0.0774	0.103
13.8	0.0375	0.0745	0.0993

13.9	0.0363	0.0718	0.0956
14	0.0351	0.0692	0.092
14.1	0.034	0.0667	0.0886
14.2	0.033	0.0644	0.0854
14.3	0.0321	0.0622	0.0824
14.4	0.0312	0.0602	0.0796
14.5	0.0304	0.0584	0.0771
14.6	0.0296	0.0567	0.0747
14.7	0.0289	0.0551	0.0725
14.8	0.0283	0.0537	0.0705
14.9	0.0277	0.0524	0.0687
15	0.0272	0.0512	0.067
15.1	0.0267	0.0501	0.0655
15.2	0.0262	0.0491	0.0641
15.3	0.0258	0.0481	0.0628
15.4	0.0255	0.0473	0.0616
15.5	0.0251	0.0465	0.0605
15.6	0.0248	0.0458	0.0595
15.7	0.0245	0.0451	0.0586
15.8	0.0242	0.0445	0.0578
15.9	0.024	0.044	0.057
16	0.0237	0.0435	0.0563
16.1	0.0235	0.043	0.0557
16.2	0.0233	0.0426	0.0551
16.3	0.0232	0.0423	0.0546
16.4	0.023	0.0419	0.0542
16.5	0.0228	0.0416	0.0537
16.6	0.0227	0.0413	0.0533
16.7	0.0226	0.041	0.053
16.8	0.0225	0.0408	0.0527
16.9	0.0224	0.0406	0.0524
17	0.0222	0.0404	0.0521
17.1	0.0222	0.0402	0.0519
17.2	0.0221	0.04	0.0517
17.3	0.022	0.0399	0.0515
17.4	0.0219	0.0398	0.0513
17.5	0.0218	0.0396	0.0511
17.6	0.0218	0.0395	0.0509
17.7	0.0217	0.0393	0.0507
17.8	0.0216	0.0392	0.0506
17.9	0.0215	0.0391	0.0504
18	0.0215	0.0389	0.0502
18.1	0.0214	0.0388	0.05
18.2	0.0213	0.0387	0.0499
18.3	0.0212	0.0385	0.0497
18.4	0.0212	0.0384	0.0495
18.5	0.0211	0.0382	0.0493
18.6	0.021	0.0381	0.0492
18.7	0.0209	0.038	0.049
18.8	0.0209	0.0378	0.0488

18.9	0.0208	0.0377	0.0487
19	0.0207	0.0376	0.0485
19.1	0.0206	0.0375	0.0483
19.2	0.0206	0.0373	0.0481
19.3	0.0205	0.0372	0.048
19.4	0.0204	0.0371	0.0478
19.5	0.0204	0.0369	0.0476
19.6	0.0203	0.0368	0.0475
19.7	0.0202	0.0367	0.0473
19.8	0.0201	0.0365	0.0471
19.9	0.0201	0.0364	0.047
20	0.02	0.0363	0.0468
20.1	0.0199	0.0362	0.0467
20.2	0.0199	0.036	0.0465
20.3	0.0198	0.0359	0.0463
20.4	0.0197	0.0358	0.0462
20.5	0.0197	0.0357	0.046
20.6	0.0196	0.0355	0.0458
20.7	0.0195	0.0354	0.0457
20.8	0.0194	0.0353	0.0455
20.9	0.0194	0.0352	0.0454
21	0.0193	0.035	0.0452
21.1	0.0192	0.0349	0.045
21.2	0.0192	0.0348	0.0449
21.3	0.0191	0.0347	0.0447
21.4	0.019	0.0346	0.0446
21.5	0.019	0.0344	0.0444
21.6	0.0189	0.0343	0.0443
21.7	0.0188	0.0342	0.0441
21.8	0.0188	0.0341	0.044
21.9	0.0187	0.034	0.0438
22	0.0186	0.0338	0.0436
22.1	0.0186	0.0337	0.0435
22.2	0.0185	0.0336	0.0433
22.3	0.0185	0.0335	0.0432
22.4	0.0184	0.0334	0.043
22.5	0.0183	0.0332	0.0429
22.6	0.0183	0.0331	0.0427
22.7	0.0182	0.033	0.0426
22.8	0.0181	0.0329	0.0424
22.9	0.0181	0.0328	0.0423
23	0.018	0.0327	0.0421
23.1	0.0179	0.0326	0.042
23.2	0.0179	0.0324	0.0418
23.3	0.0178	0.0323	0.0417
23.4	0.0178	0.0322	0.0416
23.5	0.0177	0.0321	0.0414
23.6	0.0176	0.032	0.0413
23.7	0.0176	0.0319	0.0411
23.8	0.0175	0.0318	0.041

23.9	0.0174	0.0317	0.0408
24	0.0174	0.0315	0.0407
24.1	0.0173	0.0314	0.0405
24.2	0.0173	0.0313	0.0404
24.3	0.0172	0.0312	0.0403
24.4	0.0171	0.0311	0.0401
24.5	0.0171	0.031	0.04
24.6	0.017	0.0309	0.0398
24.7	0.017	0.0308	0.0397
24.8	0.0169	0.0307	0.0396
24.9	0.0168	0.0306	0.0394
25	0.0168	0.0305	0.0393
25.1	0.0167	0.0304	0.0392
25.2	0.0167	0.0302	0.039
25.3	0.0166	0.0301	0.0389
25.4	0.0166	0.03	0.0387
25.5	0.0165	0.0299	0.0386
25.6	0.0164	0.0298	0.0385
25.7	0.0164	0.0297	0.0383
25.8	0.0163	0.0296	0.0382
25.9	0.0163	0.0295	0.0381
26	0.0162	0.0294	0.0379
26.1	0.0162	0.0293	0.0378
26.2	0.0161	0.0292	0.0377
26.3	0.016	0.0291	0.0375
26.4	0.016	0.029	0.0374
26.5	0.0159	0.0289	0.0373
26.6	0.0159	0.0288	0.0371
26.7	0.0158	0.0287	0.037
26.8	0.0158	0.0286	0.0369
26.9	0.0157	0.0285	0.0368
27	0.0157	0.0284	0.0366
27.1	0.0156	0.0283	0.0365
27.2	0.0155	0.0282	0.0364
27.3	0.0155	0.0281	0.0362
27.4	0.0154	0.028	0.0361
27.5	0.0154	0.0279	0.036
27.6	0.0153	0.0278	0.0359
27.7	0.0153	0.0277	0.0357
27.8	0.0152	0.0276	0.0356
27.9	0.0152	0.0275	0.0355
28	0.0151	0.0274	0.0354
28.1	0.0151	0.0273	0.0352
28.2	0.015	0.0272	0.0351
28.3	0.015	0.0271	0.035
28.4	0.0149	0.027	0.0349
28.5	0.0148	0.0269	0.0348
28.6	0.0148	0.0268	0.0346
28.7	0.0147	0.0268	0.0345
28.8	0.0147	0.0267	0.0344

28.9	0.0146	0.0266	0.0343
29	0.0146	0.0265	0.0342
29.1	0.0145	0.0264	0.034
29.2	0.0145	0.0263	0.0339
29.3	0.0144	0.0262	0.0338
29.4	0.0144	0.0261	0.0337
29.5	0.0143	0.026	0.0336
29.6	0.0143	0.0259	0.0334
29.7	0.0142	0.0258	0.0333
29.8	0.0142	0.0257	0.0332
29.9	0.0141	0.0257	0.0331
30	0.0141	0.0256	0.033
30.1	0.014	0.0255	0.0329
30.2	0.014	0.0254	0.0327
30.3	0.0139	0.0253	0.0326
30.4	0.0139	0.0252	0.0325
30.5	0.0138	0.0251	0.0324
30.6	0.0138	0.025	0.0323
30.7	0.0137	0.0249	0.0322
30.8	0.0137	0.0249	0.0321
30.9	0.0137	0.0248	0.032
31	0.0136	0.0247	0.0318
31.1	0.0136	0.0246	0.0317
31.2	0.0135	0.0245	0.0316
31.3	0.0135	0.0244	0.0315
31.4	0.0134	0.0243	0.0314
31.5	0.0134	0.0243	0.0313
31.6	0.0133	0.0242	0.0312
31.7	0.0133	0.0241	0.0311
31.8	0.0132	0.024	0.031
31.9	0.0132	0.0239	0.0309
32	0.0131	0.0238	0.0307
32.1	0.0131	0.0237	0.0306
32.2	0.013	0.0237	0.0305
32.3	0.013	0.0236	0.0304
32.4	0.013	0.0235	0.0303
32.5	0.0129	0.0234	0.0302
32.6	0.0129	0.0233	0.0301
32.7	0.0128	0.0233	0.03
32.8	0.0128	0.0232	0.0299
32.9	0.0127	0.0231	0.0298
33	0.0127	0.023	0.0297
33.1	0.0126	0.0229	0.0296
33.2	0.0126	0.0229	0.0295
33.3	0.0126	0.0228	0.0294
33.4	0.0125	0.0227	0.0293
33.5	0.0125	0.0226	0.0292
33.6	0.0124	0.0225	0.0291
33.7	0.0124	0.0225	0.029
33.8	0.0123	0.0224	0.0289

33.9	0.0123	0.0223	0.0288
34	0.0122	0.0222	0.0287
34.1	0.0122	0.0221	0.0286
34.2	0.0122	0.0221	0.0285
34.3	0.0121	0.022	0.0284
34.4	0.0121	0.0219	0.0283
34.5	0.012	0.0218	0.0282
34.6	0.012	0.0218	0.0281
34.7	0.0119	0.0217	0.028
34.8	0.0119	0.0216	0.0279
34.9	0.0119	0.0215	0.0278
35	0.0118	0.0215	0.0277
35.1	0.0118	0.0214	0.0276
35.2	0.0117	0.0213	0.0275
35.3	0.0117	0.0212	0.0274
35.4	0.0117	0.0212	0.0273
35.5	0.0116	0.0211	0.0272
35.6	0.0116	0.021	0.0271
35.7	0.0115	0.0209	0.027
35.8	0.0115	0.0209	0.0269
35.9	0.0115	0.0208	0.0268
36	0.0114	0.0207	0.0267
36.1	0.0114	0.0206	0.0266
36.2	0.0113	0.0206	0.0265
36.3	0.0113	0.0205	0.0264
36.4	0.0113	0.0204	0.0264
36.5	0.0112	0.0204	0.0263
36.6	0.0112	0.0203	0.0262
36.7	0.0111	0.0202	0.0261
36.8	0.0111	0.0201	0.026
36.9	0.0111	0.0201	0.0259
37	0.011	0.02	0.0258
37.1	0.011	0.0199	0.0257
37.2	0.0109	0.0199	0.0256
37.3	0.0109	0.0198	0.0255
37.4	0.0109	0.0197	0.0254
37.5	0.0108	0.0197	0.0254
37.6	0.0108	0.0196	0.0253
37.7	0.0108	0.0195	0.0252
37.8	0.0107	0.0194	0.0251
37.9	0.0107	0.0194	0.025
38	0.0106	0.0193	0.0249
38.1	0.0106	0.0192	0.0248
38.2	0.0106	0.0192	0.0247
38.3	0.0105	0.0191	0.0247
38.4	0.0105	0.019	0.0246
38.5	0.0105	0.019	0.0245
38.6	0.0104	0.0189	0.0244
38.7	0.0104	0.0188	0.0243
38.8	0.0104	0.0188	0.0242

38.9	0.0103	0.0187	0.0241
39	0.0103	0.0186	0.0241
39.1	0.0102	0.0186	0.024
39.2	0.0102	0.0185	0.0239
39.3	0.0102	0.0185	0.0238
39.4	0.0101	0.0184	0.0237
39.5	0.0101	0.0183	0.0236
39.6	0.0101	0.0183	0.0236
39.7	0.01	0.0182	0.0235
39.8	0.00999	0.0181	0.0234
39.9	0.00996	0.0181	0.0233
40	0.00992	0.018	0.0232
40.1	0.00989	0.0179	0.0231
40.2	0.00985	0.0179	0.0231
40.3	0.00982	0.0178	0.023
40.4	0.00979	0.0178	0.0229
40.5	0.00975	0.0177	0.0228
40.6	0.00972	0.0176	0.0227
40.7	0.00968	0.0176	0.0227
40.8	0.00965	0.0175	0.0226
40.9	0.00962	0.0174	0.0225
41	0.00958	0.0174	0.0224
41.1	0.00955	0.0173	0.0224
41.2	0.00952	0.0173	0.0223
41.3	0.00948	0.0172	0.0222
41.4	0.00945	0.0171	0.0221
41.5	0.00942	0.0171	0.022
41.6	0.00938	0.017	0.022
41.7	0.00935	0.017	0.0219
41.8	0.00932	0.0169	0.0218
41.9	0.00928	0.0168	0.0217
42	0.00925	0.0168	0.0217
42.1	0.00922	0.0167	0.0216
42.2	0.00919	0.0167	0.0215
42.3	0.00916	0.0166	0.0214
42.4	0.00912	0.0166	0.0214
42.5	0.00909	0.0165	0.0213
42.6	0.00906	0.0164	0.0212
42.7	0.00903	0.0164	0.0211
42.8	0.009	0.0163	0.0211
42.9	0.00897	0.0163	0.021
43	0.00893	0.0162	0.0209
43.1	0.0089	0.0162	0.0208
43.2	0.00887	0.0161	0.0208
43.3	0.00884	0.016	0.0207
43.4	0.00881	0.016	0.0206
43.5	0.00878	0.0159	0.0205
43.6	0.00875	0.0159	0.0205
43.7	0.00872	0.0158	0.0204
43.8	0.00869	0.0158	0.0203

43.9	0.00866	0.0157	0.0203
44	0.00863	0.0157	0.0202
44.1	0.0086	0.0156	0.0201
44.2	0.00857	0.0155	0.02
44.3	0.00854	0.0155	0.02
44.4	0.00851	0.0154	0.0199
44.5	0.00848	0.0154	0.0198
44.6	0.00845	0.0153	0.0198
44.7	0.00842	0.0153	0.0197
44.8	0.00839	0.0152	0.0196
44.9	0.00836	0.0152	0.0196
45	0.00833	0.0151	0.0195
45.1	0.0083	0.0151	0.0194
45.2	0.00827	0.015	0.0194
45.3	0.00824	0.015	0.0193
45.4	0.00821	0.0149	0.0192
45.5	0.00818	0.0148	0.0192
45.6	0.00816	0.0148	0.0191
45.7	0.00813	0.0147	0.019
45.8	0.0081	0.0147	0.019
45.9	0.00807	0.0146	0.0189
46	0.00804	0.0146	0.0188
46.1	0.00801	0.0145	0.0188
46.2	0.00799	0.0145	0.0187
46.3	0.00796	0.0144	0.0186
46.4	0.00793	0.0144	0.0186
46.5	0.0079	0.0143	0.0185
46.6	0.00788	0.0143	0.0184
46.7	0.00785	0.0142	0.0184
46.8	0.00782	0.0142	0.0183
46.9	0.00779	0.0141	0.0182
47	0.00777	0.0141	0.0182
47.1	0.00774	0.014	0.0181
47.2	0.00771	0.014	0.018
47.3	0.00768	0.0139	0.018
47.4	0.00766	0.0139	0.0179
47.5	0.00763	0.0138	0.0179
47.6	0.0076	0.0138	0.0178
47.7	0.00758	0.0137	0.0177
47.8	0.00755	0.0137	0.0177
47.9	0.00752	0.0137	0.0176
48	0.0075	0.0136	0.0175
48.1	0.00747	0.0136	0.0175
48.2	0.00745	0.0135	0.0174
48.3	0.00742	0.0135	0.0174
48.4	0.00739	0.0134	0.0173
48.5	0.00737	0.0134	0.0172
48.6	0.00734	0.0133	0.0172
48.7	0.00732	0.0133	0.0171
48.8	0.00729	0.0132	0.0171

48.9	0.00727	0.0132	0.017
49	0.00724	0.0131	0.0169
49.1	0.00721	0.0131	0.0169
49.2	0.00719	0.013	0.0168
49.3	0.00716	0.013	0.0168
49.4	0.00714	0.013	0.0167
49.5	0.00711	0.0129	0.0167
49.6	0.00709	0.0129	0.0166
49.7	0.00706	0.0128	0.0165
49.8	0.00704	0.0128	0.0165
49.9	0.00702	0.0127	0.0164
50	0.00699	0.0127	0.0164
50.1	0.00697	0.0126	0.0163
50.2	0.00694	0.0126	0.0162
50.3	0.00692	0.0126	0.0162
50.4	0.00689	0.0125	0.0161
50.5	0.00687	0.0125	0.0161
50.6	0.00685	0.0124	0.016
50.7	0.00682	0.0124	0.016
50.8	0.0068	0.0123	0.0159
50.9	0.00677	0.0123	0.0159
51	0.00675	0.0122	0.0158
51.1	0.00673	0.0122	0.0157
51.2	0.0067	0.0122	0.0157
51.3	0.00668	0.0121	0.0156
51.4	0.00666	0.0121	0.0156
51.5	0.00663	0.012	0.0155
51.6	0.00661	0.012	0.0155
51.7	0.00659	0.012	0.0154
51.8	0.00656	0.0119	0.0154
51.9	0.00654	0.0119	0.0153
52	0.00652	0.0118	0.0153
52.1	0.00649	0.0118	0.0152
52.2	0.00647	0.0117	0.0151
52.3	0.00645	0.0117	0.0151
52.4	0.00643	0.0117	0.015
52.5	0.0064	0.0116	0.015
52.6	0.00638	0.0116	0.0149
52.7	0.00636	0.0115	0.0149
52.8	0.00634	0.0115	0.0148
52.9	0.00632	0.0115	0.0148
53	0.00629	0.0114	0.0147
53.1	0.00627	0.0114	0.0147
53.2	0.00625	0.0113	0.0146
53.3	0.00623	0.0113	0.0146
53.4	0.00621	0.0113	0.0145
53.5	0.00618	0.0112	0.0145
53.6	0.00616	0.0112	0.0144
53.7	0.00614	0.0111	0.0144
53.8	0.00612	0.0111	0.0143

53.9	0.0061	0.0111	0.0143
54	0.00608	0.011	0.0142
54.1	0.00606	0.011	0.0142
54.2	0.00603	0.0109	0.0141
54.3	0.00601	0.0109	0.0141
54.4	0.00599	0.0109	0.014
54.5	0.00597	0.0108	0.014
54.6	0.00595	0.0108	0.0139
54.7	0.00593	0.0108	0.0139
54.8	0.00591	0.0107	0.0138
54.9	0.00589	0.0107	0.0138
55	0.00587	0.0106	0.0137
55.1	0.00585	0.0106	0.0137
55.2	0.00583	0.0106	0.0136
55.3	0.00581	0.0105	0.0136
55.4	0.00579	0.0105	0.0135
55.5	0.00577	0.0105	0.0135
55.6	0.00575	0.0104	0.0134
55.7	0.00572	0.0104	0.0134
55.8	0.0057	0.0104	0.0134
55.9	0.00568	0.0103	0.0133
56	0.00567	0.0103	0.0133
56.1	0.00565	0.0102	0.0132
56.2	0.00563	0.0102	0.0132
56.3	0.00561	0.0102	0.0131
56.4	0.00559	0.0101	0.0131
56.5	0.00557	0.0101	0.013
56.6	0.00555	0.0101	0.013
56.7	0.00553	0.01	0.0129
56.8	0.00551	0.00999	0.0129
56.9	0.00549	0.00996	0.0128
57	0.00547	0.00992	0.0128
57.1	0.00545	0.00989	0.0128
57.2	0.00543	0.00986	0.0127
57.3	0.00541	0.00982	0.0127
57.4	0.00539	0.00979	0.0126
57.5	0.00537	0.00975	0.0126
57.6	0.00536	0.00972	0.0125
57.7	0.00534	0.00968	0.0125
57.8	0.00532	0.00965	0.0124
57.9	0.0053	0.00962	0.0124
58	0.00528	0.00958	0.0124
58.1	0.00526	0.00955	0.0123
58.2	0.00524	0.00952	0.0123
58.3	0.00523	0.00948	0.0122
58.4	0.00521	0.00945	0.0122
58.5	0.00519	0.00942	0.0121
58.6	0.00517	0.00938	0.0121
58.7	0.00515	0.00935	0.0121
58.8	0.00514	0.00932	0.012

58.9	0.00512	0.00929	0.012
59	0.0051	0.00925	0.0119
59.1	0.00508	0.00922	0.0119
59.2	0.00506	0.00919	0.0119
59.3	0.00505	0.00916	0.0118
59.4	0.00503	0.00912	0.0118
59.5	0.00501	0.00909	0.0117
59.6	0.00499	0.00906	0.0117
59.7	0.00498	0.00903	0.0116
59.8	0.00496	0.009	0.0116
59.9	0.00494	0.00897	0.0116
60	0.00492	0.00893	0.0115
60.1	0.00491	0.0089	0.0115
60.2	0.00489	0.00887	0.0114
60.3	0.00487	0.00884	0.0114
60.4	0.00486	0.00881	0.0114
60.5	0.00484	0.00878	0.0113
60.6	0.00482	0.00875	0.0113
60.7	0.0048	0.00872	0.0112
60.8	0.00479	0.00869	0.0112
60.9	0.00477	0.00866	0.0112
61	0.00475	0.00863	0.0111
61.1	0.00474	0.0086	0.0111
61.2	0.00472	0.00857	0.0111
61.3	0.0047	0.00854	0.011
61.4	0.00469	0.00851	0.011
61.5	0.00467	0.00848	0.0109
61.6	0.00466	0.00845	0.0109
61.7	0.00464	0.00842	0.0109
61.8	0.00462	0.00839	0.0108
61.9	0.00461	0.00836	0.0108
62	0.00459	0.00833	0.0107
62.1	0.00457	0.0083	0.0107
62.2	0.00456	0.00827	0.0107
62.3	0.00454	0.00824	0.0106
62.4	0.00453	0.00821	0.0106
62.5	0.00451	0.00818	0.0106
62.6	0.0045	0.00816	0.0105
62.7	0.00448	0.00813	0.0105
62.8	0.00446	0.0081	0.0104
62.9	0.00445	0.00807	0.0104
63	0.00443	0.00804	0.0104
63.1	0.00442	0.00801	0.0103
63.2	0.0044	0.00799	0.0103
63.3	0.00439	0.00796	0.0103
63.4	0.00437	0.00793	0.0102
63.5	0.00436	0.0079	0.0102
63.6	0.00434	0.00788	0.0102
63.7	0.00433	0.00785	0.0101
63.8	0.00431	0.00782	0.0101

63.9	0.0043	0.00779	0.0101
64	0.00428	0.00777	0.01
64.1	0.00427	0.00774	0.00998
64.2	0.00425	0.00771	0.00995
64.3	0.00424	0.00768	0.00991
64.4	0.00422	0.00766	0.00988
64.5	0.00421	0.00763	0.00984
64.6	0.00419	0.0076	0.00981
64.7	0.00418	0.00758	0.00978
64.8	0.00416	0.00755	0.00974
64.9	0.00415	0.00752	0.00971
65	0.00413	0.0075	0.00967
65.1	0.00412	0.00747	0.00964
65.2	0.0041	0.00745	0.00961
65.3	0.00409	0.00742	0.00957
65.4	0.00408	0.00739	0.00954
65.5	0.00406	0.00737	0.00951
65.6	0.00405	0.00734	0.00947
65.7	0.00403	0.00732	0.00944
65.8	0.00402	0.00729	0.00941
65.9	0.004	0.00727	0.00937
66	0.00399	0.00724	0.00934
66.1	0.00398	0.00721	0.00931
66.2	0.00396	0.00719	0.00927
66.3	0.00395	0.00716	0.00924
66.4	0.00393	0.00714	0.00921
66.5	0.00392	0.00711	0.00918
66.6	0.00391	0.00709	0.00915
66.7	0.00389	0.00706	0.00911
66.8	0.00388	0.00704	0.00908
66.9	0.00387	0.00702	0.00905
67	0.00385	0.00699	0.00902
67.1	0.00384	0.00697	0.00899
67.2	0.00383	0.00694	0.00896
67.3	0.00381	0.00692	0.00892
67.4	0.0038	0.00689	0.00889
67.5	0.00379	0.00687	0.00886
67.6	0.00377	0.00685	0.00883
67.7	0.00376	0.00682	0.0088
67.8	0.00375	0.0068	0.00877
67.9	0.00373	0.00677	0.00874
68	0.00372	0.00675	0.00871
68.1	0.00371	0.00673	0.00868
68.2	0.00369	0.0067	0.00865
68.3	0.00368	0.00668	0.00862
68.4	0.00367	0.00666	0.00859
68.5	0.00366	0.00663	0.00856
68.6	0.00364	0.00661	0.00853
68.7	0.00363	0.00659	0.0085
68.8	0.00362	0.00656	0.00847

68.9	0.0036	0.00654	0.00844
69	0.00359	0.00652	0.00841
69.1	0.00358	0.00649	0.00838
69.2	0.00357	0.00647	0.00835
69.3	0.00355	0.00645	0.00832
69.4	0.00354	0.00643	0.00829
69.5	0.00353	0.0064	0.00826
69.6	0.00352	0.00638	0.00823
69.7	0.00351	0.00636	0.0082
69.8	0.00349	0.00634	0.00818
69.9	0.00348	0.00632	0.00815
70	0.00347	0.00629	0.00812
70.1	0.00346	0.00627	0.00809
70.2	0.00344	0.00625	0.00806
70.3	0.00343	0.00623	0.00803
70.4	0.00342	0.00621	0.00801
70.5	0.00341	0.00618	0.00798
70.6	0.0034	0.00616	0.00795
70.7	0.00338	0.00614	0.00792
70.8	0.00337	0.00612	0.00789
70.9	0.00336	0.0061	0.00787
71	0.00335	0.00608	0.00784
71.1	0.00334	0.00606	0.00781
71.2	0.00333	0.00603	0.00778
71.3	0.00331	0.00601	0.00776
71.4	0.0033	0.00599	0.00773
71.5	0.00329	0.00597	0.0077
71.6	0.00328	0.00595	0.00768
71.7	0.00327	0.00593	0.00765
71.8	0.00326	0.00591	0.00762
71.9	0.00325	0.00589	0.0076
72	0.00323	0.00587	0.00757
72.1	0.00322	0.00585	0.00754
72.2	0.00321	0.00583	0.00752
72.3	0.0032	0.00581	0.00749
72.4	0.00319	0.00579	0.00746
72.5	0.00318	0.00577	0.00744
72.6	0.00317	0.00575	0.00741
72.7	0.00316	0.00573	0.00739
72.8	0.00314	0.00571	0.00736
72.9	0.00313	0.00569	0.00733
73	0.00312	0.00567	0.00731
73.1	0.00311	0.00565	0.00728
73.2	0.0031	0.00563	0.00726
73.3	0.00309	0.00561	0.00723
73.4	0.00308	0.00559	0.00721
73.5	0.00307	0.00557	0.00718
73.6	0.00306	0.00555	0.00716
73.7	0.00305	0.00553	0.00713
73.8	0.00304	0.00551	0.00711

73.9	0.00303	0.00549	0.00708
74	0.00301	0.00547	0.00706
74.1	0.003	0.00545	0.00703
74.2	0.00299	0.00543	0.00701
74.3	0.00298	0.00541	0.00698
74.4	0.00297	0.00539	0.00696
74.5	0.00296	0.00538	0.00693
74.6	0.00295	0.00536	0.00691
74.7	0.00294	0.00534	0.00689
74.8	0.00293	0.00532	0.00686
74.9	0.00292	0.0053	0.00684
75	0.00291	0.00528	0.00681
75.1	0.0029	0.00526	0.00679
75.2	0.00289	0.00525	0.00677
75.3	0.00288	0.00523	0.00674
75.4	0.00287	0.00521	0.00672
75.5	0.00286	0.00519	0.0067
75.6	0.00285	0.00517	0.00667
75.7	0.00284	0.00515	0.00665
75.8	0.00283	0.00514	0.00663
75.9	0.00282	0.00512	0.0066
76	0.00281	0.0051	0.00658
76.1	0.0028	0.00508	0.00656
76.2	0.00279	0.00506	0.00653
76.3	0.00278	0.00505	0.00651
76.4	0.00277	0.00503	0.00649
76.5	0.00276	0.00501	0.00646
76.6	0.00275	0.00499	0.00644
76.7	0.00274	0.00498	0.00642
76.8	0.00273	0.00496	0.0064
76.9	0.00272	0.00494	0.00637
77	0.00271	0.00492	0.00635
77.1	0.0027	0.00491	0.00633
77.2	0.0027	0.00489	0.00631
77.3	0.00269	0.00487	0.00629
77.4	0.00268	0.00486	0.00626
77.5	0.00267	0.00484	0.00624
77.6	0.00266	0.00482	0.00622
77.7	0.00265	0.00481	0.0062
77.8	0.00264	0.00479	0.00618
77.9	0.00263	0.00477	0.00616
78	0.00262	0.00475	0.00613
78.1	0.00261	0.00474	0.00611
78.2	0.0026	0.00472	0.00609
78.3	0.00259	0.00471	0.00607
78.4	0.00258	0.00469	0.00605
78.5	0.00258	0.00467	0.00603
78.6	0.00257	0.00466	0.00601
78.7	0.00256	0.00464	0.00599
78.8	0.00255	0.00462	0.00596

78.9	0.00254	0.00461	0.00594
79	0.00253	0.00459	0.00592
79.1	0.00252	0.00458	0.0059
79.2	0.00251	0.00456	0.00588
79.3	0.0025	0.00454	0.00586
79.4	0.0025	0.00453	0.00584
79.5	0.00249	0.00451	0.00582
79.6	0.00248	0.0045	0.0058
79.7	0.00247	0.00448	0.00578
79.8	0.00246	0.00446	0.00576
79.9	0.00245	0.00445	0.00574
80	0.00244	0.00443	0.00572
80.1	0.00243	0.00442	0.0057
80.2	0.00243	0.0044	0.00568
80.3	0.00242	0.00439	0.00566
80.4	0.00241	0.00437	0.00564
80.5	0.0024	0.00436	0.00562
80.6	0.00239	0.00434	0.0056
80.7	0.00238	0.00433	0.00558
80.8	0.00238	0.00431	0.00556
80.9	0.00237	0.0043	0.00554
81	0.00236	0.00428	0.00552
81.1	0.00235	0.00427	0.0055
81.2	0.00234	0.00425	0.00548
81.3	0.00233	0.00424	0.00546
81.4	0.00233	0.00422	0.00544
81.5	0.00232	0.00421	0.00543
81.6	0.00231	0.00419	0.00541
81.7	0.0023	0.00418	0.00539
81.8	0.00229	0.00416	0.00537
81.9	0.00229	0.00415	0.00535
82	0.00228	0.00413	0.00533
82.1	0.00227	0.00412	0.00531
82.2	0.00226	0.0041	0.00529
82.3	0.00225	0.00409	0.00528
82.4	0.00225	0.00408	0.00526
82.5	0.00224	0.00406	0.00524
82.6	0.00223	0.00405	0.00522
82.7	0.00222	0.00403	0.0052
82.8	0.00221	0.00402	0.00518
82.9	0.00221	0.004	0.00517
83	0.0022	0.00399	0.00515
83.1	0.00219	0.00398	0.00513
83.2	0.00218	0.00396	0.00511
83.3	0.00218	0.00395	0.00509
83.4	0.00217	0.00394	0.00508
83.5	0.00216	0.00392	0.00506
83.6	0.00215	0.00391	0.00504
83.7	0.00215	0.00389	0.00502
83.8	0.00214	0.00388	0.00501

83.9	0.00213	0.00387	0.00499
84	0.00212	0.00385	0.00497
84.1	0.00212	0.00384	0.00495
84.2	0.00211	0.00383	0.00494
84.3	0.0021	0.00381	0.00492
84.4	0.00209	0.0038	0.0049
84.5	0.00209	0.00379	0.00488
84.6	0.00208	0.00377	0.00487
84.7	0.00207	0.00376	0.00485
84.8	0.00207	0.00375	0.00483
84.9	0.00206	0.00373	0.00482
85	0.00205	0.00372	0.0048
85.1	0.00204	0.00371	0.00478
85.2	0.00204	0.00369	0.00477
85.3	0.00203	0.00368	0.00475
85.4	0.00202	0.00367	0.00473
85.5	0.00201	0.00366	0.00472
85.6	0.00201	0.00364	0.0047
85.7	0.002	0.00363	0.00468
85.8	0.00199	0.00362	0.00467
85.9	0.00199	0.00361	0.00465
86	0.00198	0.00359	0.00463
86.1	0.00197	0.00358	0.00462
86.2	0.00197	0.00357	0.0046
86.3	0.00196	0.00355	0.00459
86.4	0.00195	0.00354	0.00457
86.5	0.00195	0.00353	0.00455
86.6	0.00194	0.00352	0.00454
86.7	0.00193	0.00351	0.00452
86.8	0.00193	0.00349	0.00451
86.9	0.00192	0.00348	0.00449
87	0.00191	0.00347	0.00447
87.1	0.00191	0.00346	0.00446
87.2	0.0019	0.00344	0.00444
87.3	0.00189	0.00343	0.00443
87.4	0.00189	0.00342	0.00441
87.5	0.00188	0.00341	0.0044
87.6	0.00187	0.0034	0.00438
87.7	0.00187	0.00338	0.00437
87.8	0.00186	0.00337	0.00435
87.9	0.00185	0.00336	0.00434
88	0.00185	0.00335	0.00432
88.1	0.00184	0.00334	0.00431
88.2	0.00183	0.00333	0.00429
88.3	0.00183	0.00331	0.00428
88.4	0.00182	0.0033	0.00426
88.5	0.00181	0.00329	0.00425
88.6	0.00181	0.00328	0.00423
88.7	0.0018	0.00327	0.00422
88.8	0.00179	0.00326	0.0042

88.9	0.00179	0.00325	0.00419
89	0.00178	0.00323	0.00417
89.1	0.00178	0.00322	0.00416
89.2	0.00177	0.00321	0.00414
89.3	0.00176	0.0032	0.00413
89.4	0.00176	0.00319	0.00411
89.5	0.00175	0.00318	0.0041
89.6	0.00175	0.00317	0.00409
89.7	0.00174	0.00316	0.00407
89.8	0.00173	0.00314	0.00406
89.9	0.00173	0.00313	0.00404
90	0.00172	0.00312	0.00403
90.1	0.00172	0.00311	0.00401
90.2	0.00171	0.0031	0.004
90.3	0.0017	0.00309	0.00399
90.4	0.0017	0.00308	0.00397
90.5	0.00169	0.00307	0.00396
90.6	0.00169	0.00306	0.00394
90.7	0.00168	0.00305	0.00393
90.8	0.00167	0.00304	0.00392
90.9	0.00167	0.00303	0.0039
91	0.00166	0.00302	0.00389
91.1	0.00166	0.003	0.00388
91.2	0.00165	0.00299	0.00386
91.3	0.00164	0.00298	0.00385
91.4	0.00164	0.00297	0.00384
91.5	0.00163	0.00296	0.00382
91.6	0.00163	0.00295	0.00381
91.7	0.00162	0.00294	0.0038
91.8	0.00162	0.00293	0.00378
91.9	0.00161	0.00292	0.00377
92	0.0016	0.00291	0.00376
92.1	0.0016	0.0029	0.00374
92.2	0.00159	0.00289	0.00373
92.3	0.00159	0.00288	0.00372
92.4	0.00158	0.00287	0.0037
92.5	0.00158	0.00286	0.00369
92.6	0.00157	0.00285	0.00368
92.7	0.00157	0.00284	0.00366
92.8	0.00156	0.00283	0.00365
92.9	0.00155	0.00282	0.00364
93	0.00155	0.00281	0.00363
93.1	0.00154	0.0028	0.00361
93.2	0.00154	0.00279	0.0036
93.3	0.00153	0.00278	0.00359
93.4	0.00153	0.00277	0.00358
93.5	0.00152	0.00276	0.00356
93.6	0.00152	0.00275	0.00355
93.7	0.00151	0.00274	0.00354
93.8	0.00151	0.00273	0.00353

93.9	0.0015	0.00272	0.00351
94	0.0015	0.00271	0.0035
94.1	0.00149	0.0027	0.00349
94.2	0.00149	0.0027	0.00348
94.3	0.00148	0.00269	0.00346
94.4	0.00148	0.00268	0.00345
94.5	0.00147	0.00267	0.00344
94.6	0.00146	0.00266	0.00343
94.7	0.00146	0.00265	0.00342
94.8	0.00145	0.00264	0.0034
94.9	0.00145	0.00263	0.00339
95	0.00144	0.00262	0.00338
95.1	0.00144	0.00261	0.00337
95.2	0.00143	0.0026	0.00336
95.3	0.00143	0.00259	0.00335
95.4	0.00142	0.00258	0.00333
95.5	0.00142	0.00258	0.00332
95.6	0.00141	0.00257	0.00331
95.7	0.00141	0.00256	0.0033
95.8	0.0014	0.00255	0.00329
95.9	0.0014	0.00254	0.00328
96	0.00139	0.00253	0.00326
96.1	0.00139	0.00252	0.00325
96.2	0.00138	0.00251	0.00324
96.3	0.00138	0.0025	0.00323
96.4	0.00138	0.0025	0.00322
96.5	0.00137	0.00249	0.00321
96.6	0.00137	0.00248	0.0032
96.7	0.00136	0.00247	0.00319
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96.9	0.00135	0.00245	0.00316
97	0.00135	0.00244	0.00315
97.1	0.00134	0.00243	0.00314
97.2	0.00134	0.00243	0.00313
97.3	0.00133	0.00242	0.00312
97.4	0.00133	0.00241	0.00311
97.5	0.00132	0.0024	0.0031
97.6	0.00132	0.00239	0.00309
97.7	0.00131	0.00238	0.00308
97.8	0.00131	0.00238	0.00306
97.9	0.0013	0.00237	0.00305
98	0.0013	0.00236	0.00304
98.1	0.0013	0.00235	0.00303
98.2	0.00129	0.00234	0.00302
98.3	0.00129	0.00233	0.00301
98.4	0.00128	0.00233	0.003
98.5	0.00128	0.00232	0.00299
98.6	0.00127	0.00231	0.00298
98.7	0.00127	0.0023	0.00297
98.8	0.00126	0.00229	0.00296

98.9	0.00126	0.00229	0.00295
99	0.00126	0.00228	0.00294
99.1	0.00125	0.00227	0.00293
99.2	0.00125	0.00226	0.00292
99.3	0.00124	0.00225	0.00291
99.4	0.00124	0.00225	0.0029
99.5	0.00123	0.00224	0.00289
99.6	0.00123	0.00223	0.00288
99.7	0.00123	0.00222	0.00287
99.8	0.00122	0.00222	0.00286
99.9	0.00122	0.00221	0.00285
100	0.00121	0.0022	0.00284

Event	Previous Analysis	This Analysis	
	IoH124	IoH124	ReFH
QBAR	3.31	3.33	3.98
1 yr	2.88	2.89	3.45
2 yr	2.96	2.97	3.54
30 yr	7.96	7.89	7.64
100 yr	11.79	11.87	10.3

Scaled by 1/0.89 to get from 2 yr to QBAR.
Scaled by ratio of 2yr to 1yr from MicroDrainage growth curve.

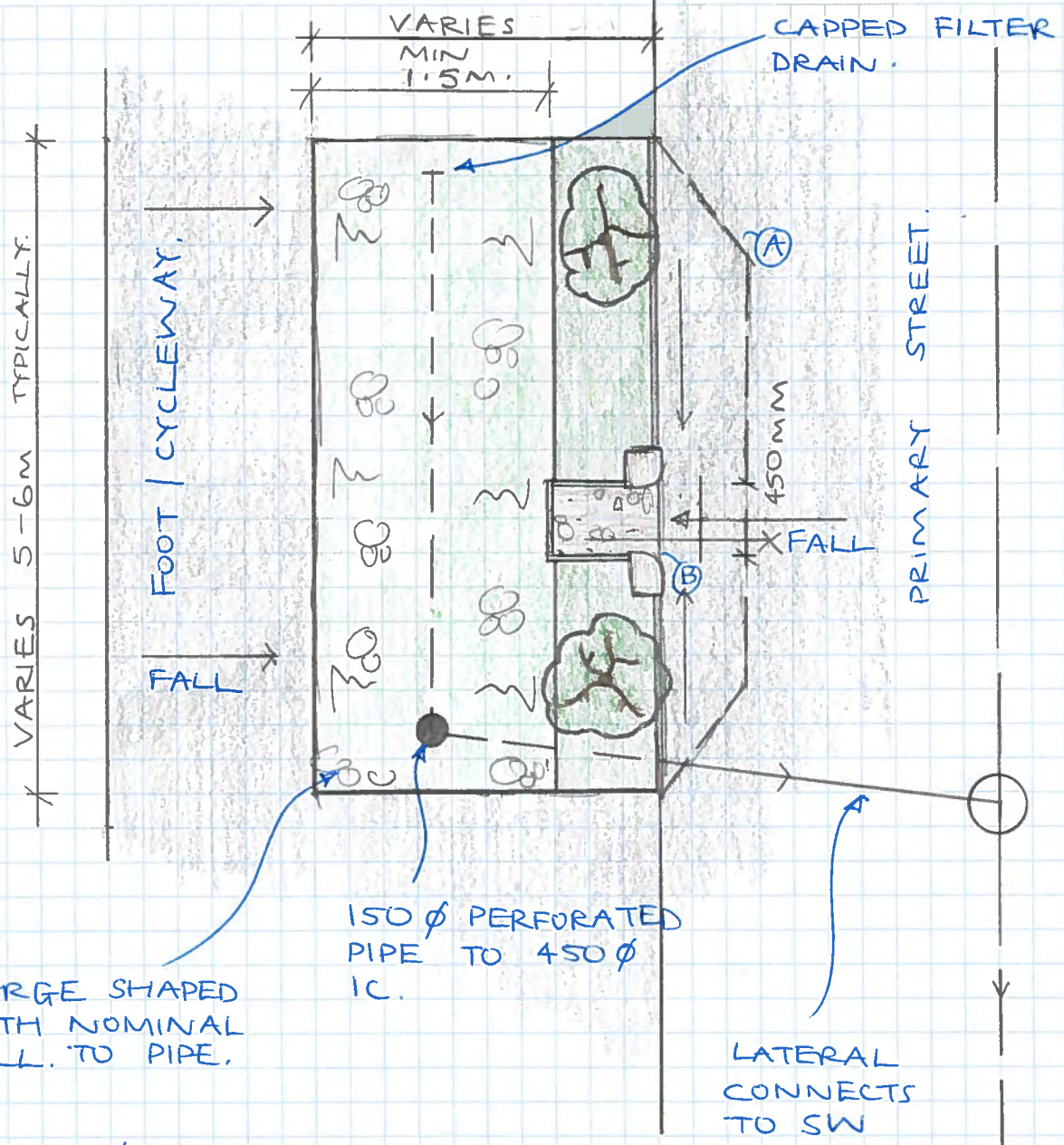
Greenfield runoff rates in l/s/ha

Appendix R Indicative Roadside Bio Retention Areas

Calculations

INDICATIVE BIO RETENTION ZONE

Project Title	WEST CAMBRIDGE - GREEN STREETS						
Project No	31500		By	ST.	Checked	Date	22 4 16



'IN LINE' OPTION

(A) KERB CAN BE EXTENDED TO FORM BUILD OUT.

(B) INLET LOCATION DEPENDANT ON VERTICAL ALIGNMENT OF ROAD / SPACING.

SWALE / VERGE PLANTER OPTION.

Sheet of

Appendix S Anglian Water Foul Water Impact Assessment

Addendum to the pre-planning assessment report dated 24 December 2015 – revision 1.0

Project Title:

Madingley Road, Cambridge

Anglian Water Services contact:

Rob Morris
Senior Growth Planning Engineer
Thorpe Wood House
Thorpe Wood
Peterborough
PE3 6WT
Mobile Number: 07702 341018
Our reference number: 4744
10 February 2015

1. Summary

This report has been undertaken in response to an enquiry from Peter Brett Associates LLP to determine the impact of flows from the site at Madingley Road, Cambridge on the performance of the existing foul sewer network. It should be read in conjunction with the pre-planning report dated 24 December 2014 and subsequent correspondence and meetings that took place in August and September of 2015, which indicated that a direct connection to the public foul sewer system with the revised proposed dry weather flow rate of 43l/s (129l/s Peak DWF) is likely to have a detrimental effect on the existing sewerage network. Further hydraulic modelling would be required to enable Anglian Water to provide a solution for draining the foul flows from the proposed development.

The analysis has been performed on the foul system only. There has been no consideration of the surface water flows as this is not within the scope of the study.

The additional foul flows from the development site which will expand the West Campus of the University of Cambridge were modelled connecting to two connection points; manhole reference no. TL43585604 (grid ref: TL4353358655) located on Wilberforce Road at a dry weather flow rate of 40l/s (120l/s Peak DWF) and to manhole reference no. TL42595201 (grid ref: TL4257859298) located on Madingley Road at a dry weather flow rate of 3l/s (9l/s Peak DWF).

The study concludes that the development will not cause detriment to the capacity of the sewerage system from the flow split at the two connection points and as such there is no requirement for off-site reinforcement.

The topography of the site indicates that a gravity regime is feasible to both connection points. Due to the proximity of the site to the connection point it is assumed that the developer will provide the necessary infrastructure to convey flows from the site to the network.

The contents of this report are based on the outputs generated by a desktop hydraulic model.

2. Hydraulic Modelling and Solutions

The proposed development site is located off Madingley Road on the West Campus of the University of Cambridge (see Figure 1). Foul flows from the site drain to Cambridge Water Recycling Centre (WRC) located to the north of the town. The proposed development comprises of a densification of the campus with a total estimated population of 18,954. The total dry weather flow is given as 43 l/s, which was calculated by the developer. The majority of the development (40l/s) will discharge to the Wilberforce Road connection point, the rest (3l/s) will discharge to the Madingley Road connection point (see figure 2).

To enable the analysis to be performed the existing hydraulic model for Cambridge was used. This was updated with manhole survey information that was carried out within the vicinity and downstream of the proposed development site as well as any other recent changes to the system.

The modelling assumptions are presented in Appendix 1.

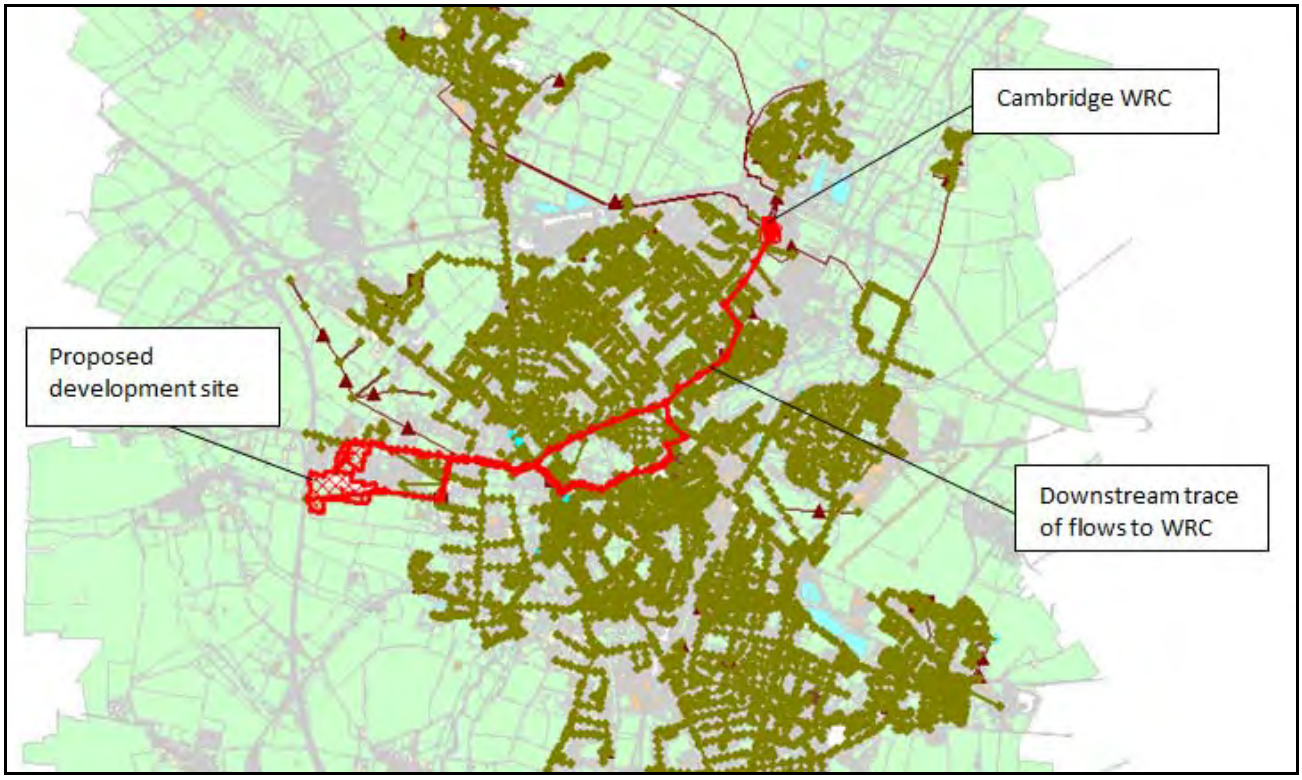


Figure 1: Showing the location of the development site and the proximity of the WRC

Proposed connection point

The proposed connection points for the development are manhole TL43585604 (NGR TL4353358655) located on Wilberforce Road and manhole TL42595201 (NGR TL4257859298) located on Madingley Road (see Figures 2, 3 and 4). The diameters of the sewers to which the proposed development will connect are 600mm (TL43585604) and 300mm (TL42595201) respectively. A review of the site topography indicates that gravity connections are feasible for both connection points.

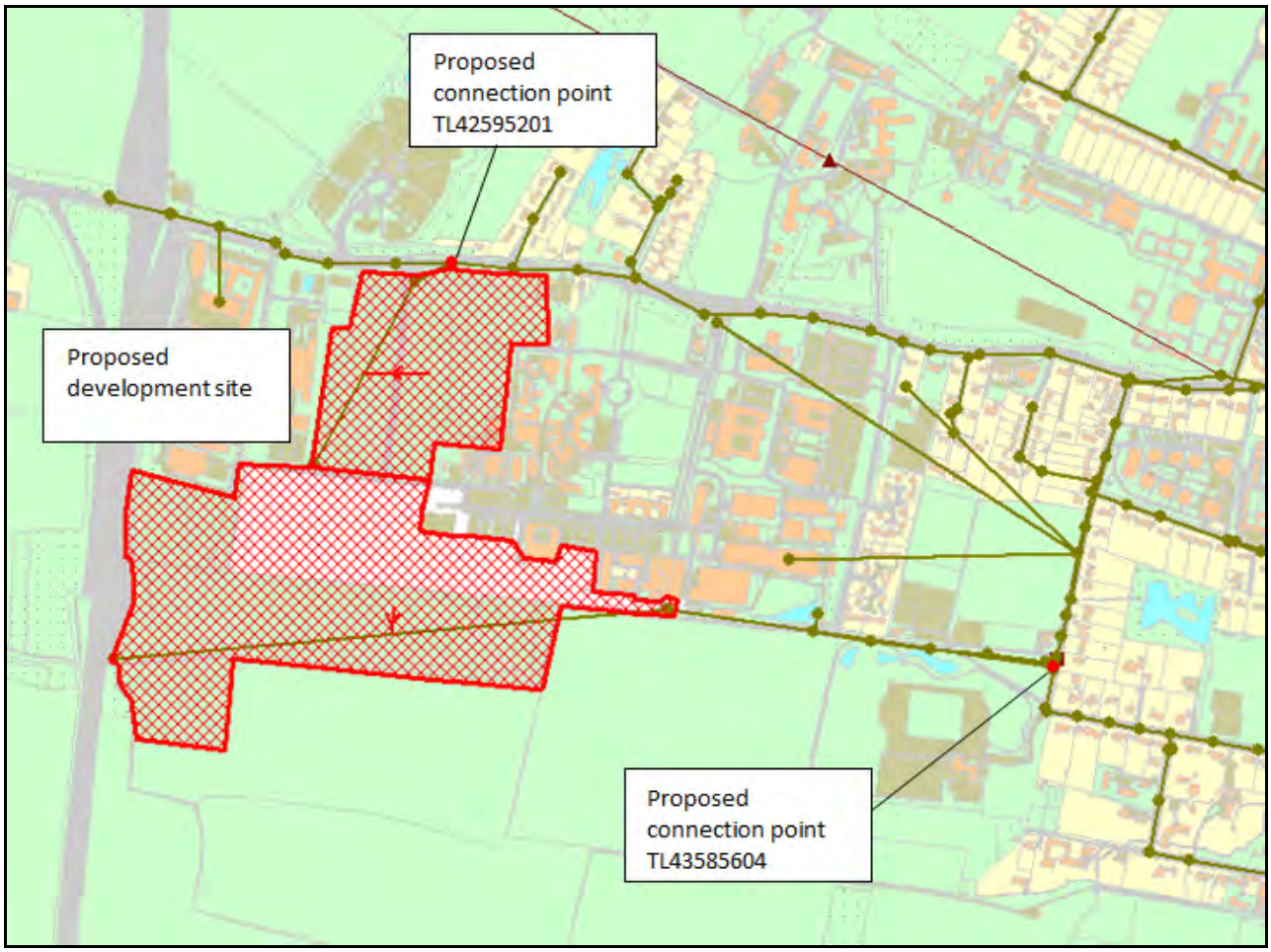


Figure 2: Showing the location of the proposed connection points

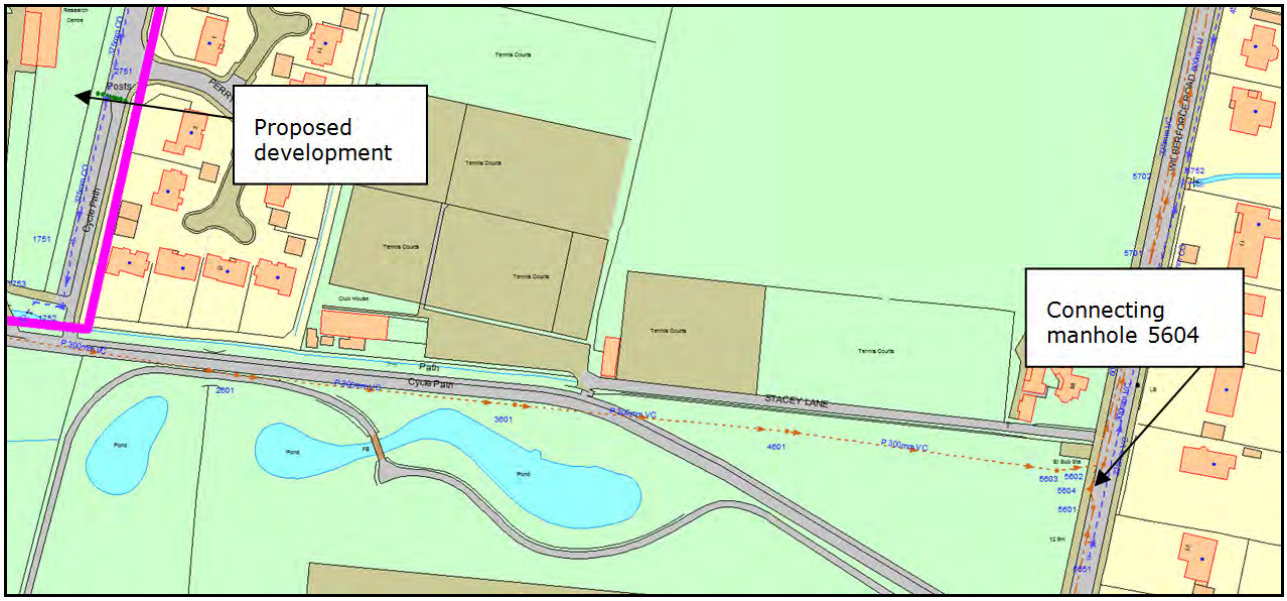


Figure 3: Showing the location of the proposed connection point in Wilberforce Road (40l/s)

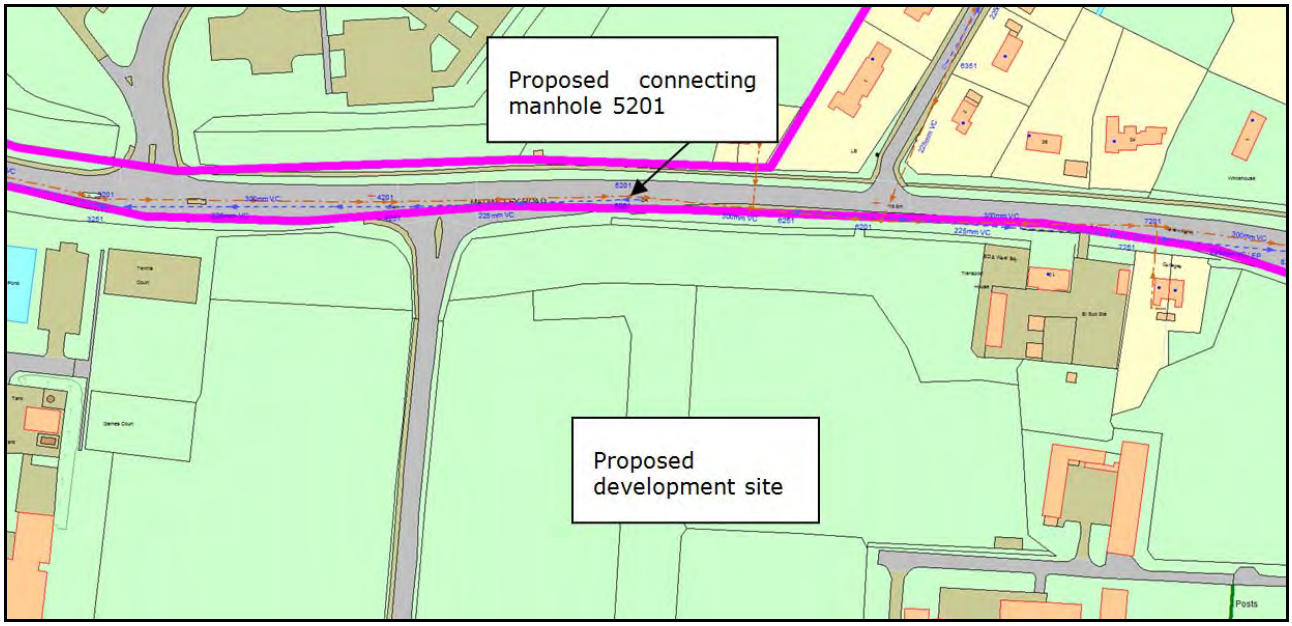


Figure 4: Showing the location of the proposed connection point in Madingley Road (3l/s)

Hydraulic modelling

The hydraulic model was run to determine the existing sewer performance during a 1 in 20 year design storm. The model was then re-run with the estimated flows from the site connecting to manhole TL43585604 (40l/s) and TL42595201 (3l/s) via gravity connections.

The model predicts no significant increase in flooding or surcharge within the sewerage network as a direct result from the flows of the new development.

It should be noted that the proposed combined total dry weather flow of 43l/s is additional to that which is currently being received from this site.

The level of detriment predicted within the existing sewerage network, due to the additional flows from the development, means that no mitigation will be required prior to the site connecting to the existing sewerage system.

3. Summary of Cost Estimates

The proposed connection points are close to the site boundary and as such it has been assumed that the developer will provide the infrastructure to convey the flows from the site to the respective connection points. Consequently, this report does not include any costs for the conveyance of flows.

4. Summary and recommendation

Estimated flows from the site at Madingley Road, Cambridge have been modelled connecting via gravity to the existing foul drainage system to two manholes reference no. TL43585604 and TL42595201 respectively, and detriment to the existing performance has not been predicted within the existing sewerage network. Therefore it is considered that there is no requirement for any off-site mitigation prior to connecting to the proposed manholes.

Conveyance of flows

It is assumed that the developer will provide the infrastructure to convey flows to the network. Therefore no costs have been provided.

This is a feasible solution for planning application purposes.

APPENDIX 1. - Development details

DWF Calculations				
	Attribute	**Value**	**Totals**	**Unit / Calculation**
	Development size	31.125		Ha (Digitised Sub-catchment area)
	Residential			
A	Residential dwellings	0		No.
B	Residential occupancy	0		No.
C	Residential population (P)	0		No. (A x B)
D	Residential PCC (G)	0		l/h/d
$E_{(avg)}$	*Residential demand - Average*		**0**	l/s (C x D)/86400
$E_{(peak)}$	*Residential demand - Peak*		**0**	l/s ($E_{(avg)}$ x 2.12)
F	**Infiltration**		**0**	l/s (0.25 x $E_{(avg)}$)
	Industrial/Trade			
G	Industrial/trade area	31.125		Ha
H	Industrial/trade discharge per ha	0.2		l/s
I	Industrial/trade domestic element per ha	0		l/s
$J_{(avg)}$	*Commercial/trade - Average*		**6.225**	l/s (GxH+GxI)
$J_{(peak)}$	*Commercial/trade- Peak*		**18.675**	l/s($J_{(avg)}$ x 3)
	Schools			
K	School PCC	0		l/h/d
L	School occupancy	0		No.
$M_{(avg)}$	*School demand - Average*		**0**	l/s (K x L)/86400
$M_{(peak)}$	*School demand - Peak*		**0**	l/s ($M_{(avg)}$ x 3)
	Other			
$N_{(avg)}$	*Other demand - Average*		**0**	l/s
$N_{(peak)}$	*Other demand - Peak*		**0**	l/s
$O_{(avg)}$	**Total Discharge - Average**		**6.225**	l/s ($E_{(avg)}$+$J_{(avg)}$+$M_{(avg)}$+$N_{(avg)}$)
$O_{(peak)}$	**Total Discharge - Peak**		**18.675**	l/s ($E_{(peak)}$+$J_{(peak)}$+$M_{(peak)}$+$N_{(peak)}$)
	DWF Total - Average		**6.225**	l/s($O_{(avg)}$ + F)
	DWF Total - Peak		**18.675**	l/s($O_{(peak)}$ + F)
	DWF modelled – Average (as per developer's calcs)		**43.0**	l/s
	DWF modelled – Peak		**129.0**	l/s

UNIVERSITY OF CAMBRIDGE

AECOM